SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1916.

No. 3, Original.

THE PEOPLE OF THE STATE OF NEW YORK, COMPLAINANTS,

vs.

STATE OF NEW JERSEY AND PASSAIC VALLEY SEWERAGE COMMISSIONERS, DEFENDANTS.

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1 At the Capitol of the United States, in the City of Washington and District of Columbia, being the present seat of the National Government of the United States, on the second Monday of October (being the twelfth day of the same month) in the year of our Lord one thousand nine hundred and eight and of the Independence of the United States the one hundred and thirty-third, the Supreme Court of the United States met agreeably to law.

And afterwards, to wit, on the 13th day of October, A. D. 1908, the following entry appears of record, viz:

2 THE PEOPLE OF THE STATE OF NEW YORK, Complainant-,

—

THE STATE OF NEW JERSEY et al.

On motion of Mr. Maurice B. Dean, of counsel for the Complainant-.

It is ordered by the Court that leave be, and the same is hereby granted to file a bill of Complaint herein and that process issue thereon, returnable on the first Monday of January next.

October 13, 1908.

Which said motion is in words and figures following, viz:

3 In the Supreme Court of the United States.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Now come the People of the State of New York by their counsel Maurice B. Dean, Esq., and move the Court to be allowed to file an original bill of complaint in the above entitled action and that the Court direct proper process issue therein against said defendants.

October 13th, 1908.

WILLIAM S. JACKSON,
Attorney General;
MAURICE B. DEAN,
Special Counsel,
20 *Broad Street, New York City.*

Endorsed: Supreme Court U. S. October Term 1908, No. 9, Original. The People of the State of New York, Compl's, vs. State of New Jersey and Passaic Valley Sewerage Commissioners. Motion for leave to file bill of complaint and for process. Filed Oct. 13th 1908.

1—3

And afterwards, to wit, on the 17th day of October, A. D. 1908, the Bill of Complaint was filed in words & figures following, viz:

4 In the Supreme Court of the United States, October Term, 1908.

In Equity. No. —, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Bill of Injunction.

To the Honorable the Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

The complainants, the People of the State of New York, bring this their bill of complaint against the State of New Jersey, one of the United States, and the Passaic Valley Sewerage Commissioners, a body politic and corporate, organized and existing under the laws of the State of New Jersey and a citizen thereof; and thereupon your orators complain and say:

Your orators are one of the States of the Union; and the State of New Jersey is one of the States of the Union. The Passaic Valley Sewerage Commissioners are a body politic and corporate,
5 organized and existing under the laws of the State of New Jersey and a citizen of that State.

The boundary line between the two States of New York and New Jersey, from a point in the middle of Hudson River opposite the point on the west shore thereof in the forty-first degree of north latitude to the main sea is the middle of the said river, of the Bay of New York, of the waters between Staten Island and New Jersey, and of Raritan Bay, to the main sea. The State of New York has and exercises exclusive jurisdiction of and over Bedlow's and Ellis' Islands and over the other islands lying in the waters above mentioned, and of and over all the waters of the Bay of New York and of and over all the waters of Hudson River lying west of Manhattan Island and to the south of the mouth of Spuyten Duyvil Creek, and of and over the lands covered by the said waters, to the low-water mark on the westerly or New Jersey side thereof, subject, however, to the exclusive right of property in the State of New Jersey in and to the land under water lying west of the middle of the Bay of New York and West of the middle of that part of the Hudson River which lies between Manhattan Island and New Jersey, as more particularly will appear by the compact or agreement entered into between the State of New York and the State of New Jersey in the year 1833, ratified by the legislature of the State of New York, by an act passed February 5, 1834, constituting chapter 8 of the Laws of 1834 and by the legislature of the State of New Jersey by an act passed February 28, 1834, and approved by Congress by an act passed June 28, 1834, constituting chapter 136 of the Laws of 1834;

and a copy of the said compact, as the same is embodied in the said act of February 5, 1834, is annexed hereto as "Schedule A" and made a part of this bill.

So much of that part of New York Bay which is commonly called the Upper Bay as belongs to the State of New York is bounded by the city of New York on the north, east, and south. On the
6 west the Upper Bay is bounded by the State of New Jersey. The shore line of the city bordering on the Upper Bay is upwards of 13 miles in length. The Hudson River and the East River flow into the Upper Bay within the city. The water front of the city bordering on those rivers and upon the bay is improved with wharves, piers, and docks which are used for the purposes of commerce, and some of them also, as well as the natural shores of the bay within the city, are used for the health and pleasure of the inhabitants.

The city of New York has a population of upwards of 4,250,000. The real property in the city is of the value of upwards of $6,240,000,000. The personal property of the inhabitants of the city which is assessed for taxation is of the value of upwards of $554,000,000, while the actual value of their personal property, including that which is not taxed, is many times that amount.

North of the forty-first degree of north latitude the Hudson River lies wholly within the State of New York. The tide ebbs and flows in it, and it is navigable, as far as Albany, one hundred and fifty miles, or thereabouts, north of New York Bay; and it is navigated by large numbers of vessels, some of which are engaged in commerce with other States of the Union or with other countries. The State of New Jersey lies in part along the westerly side of New York Bay having a shore line of about seven miles.

Your orators further show that the State of New Jersey by its legislature in the year 1902 enacted a law, constituting chapter 48 of the Laws of New Jersey of 1902, approved March 27, 1902, entitled "An act to create a sewerage district to be called Passaic Valley Sewerage District," a copy of said act being annexed hereto, marked "Schedule B" and made a part of this bill; and in the year 1907 enacted a law, constituting chapter 10 of the Laws of New Jersey of 1907, approved March 18, 1907, entitled "An act to provide for the purification of the waters of the Passaic River within the Passaic Valley
7 Sewerage District, prohibiting the discharge of sewage or other polluted matter into said portion of said river after a fixed date, and authorizing municipalities lying in whole or in part within the Passaic Valley Sewerage District, from the territory of which sewage or other polluting matter is or may be discharged into said portion of said river, to enter into contracts with each other and with the Passaic Valley Sewerage Commissioners for the intercepting and disposal of such sewage and other polluting matter, and to provide the necessary funds therefor," a copy of said act being annexed hereto marked "Schedule C" and made a part of this bill.

The occasion for the enactment of the said laws was, and so as your orators are informed and believe, the fact is, that the Passaic River has become so corrupt and polluted from the sewage which empties into it from the natural drainage area hereinafter mentioned as to

be offensive and injurious to the health and comfort of the inhabitants of the adjoining territory.

And your orators show that the defendants the Passaic Valley Sewerage Commissioners, acting as a governmental agency of the defendant the State of New Jersey, and by virtue and in execution of the authority conferred upon them by that State, and under its supervision, control, and approval pursuant to the provisions of said chapter 48 of the Laws of New Jersey of 1902, and of said chapter 10 of the Laws of New Jersey of 1907, have prepared and adopted maps, plans, specifications and estimates of cost for the construction of a joint trunk or main intercepting sewer and other plant and works, for collecting and discharging the sewage of the Passaic Valley Sewerage District referred to in the said laws, comprising altogether the natural drainage area of the Passaic River in the State of New Jersey; and that on April 20, 1908, the said Commissioners adopted a plan, in substance as follows: The main district sewer to begin in Paterson in the State of New Jersey at Prospect Street a short distance below the Great Falls, thence continuing in
8 general down along the west bank of the Passaic River until it reaches the city of Newark, where it will cross the Newark meadows of the shore of Newark Bay, where it is proposed to pass the sewage through a girt chamber intended to remove the gravel, sand, and other heavy matter, and through a screen chamber intended to remove floating matter, and thence into a pumping station where the sewage will be raised to an elevation of about fifteen feet above high water for the purpose of giving it head, and thence to continue the sewer through a tunnel under Newark Bay, and under the cities of Bayonne and Jersey City in the State of New Jersey, and through the soil underlying the waters of New York Bay to a point in the bay about half a mile north of Robins' Reef Light, on the westerly edge of the main ship channel where it is intended to discharge the said sewage into the waters of the bay from the outlet of the said sewer, which is intended to be a circular opening twelve feet in diameter. The said plan shows, and your orators are informed and believe, that the area of the said Passaic Valley Sewerage District is 103.23 square miles. The population of the municipalities whose territory the proposed sewer is intended to drain, was in the year 1905, as ascertained by the Federal census, 601,817 persons, and the said Commissioners estimate, and so, as your orators are informed and believe the fact will be that by the year 1911 the population of the said territory will be upwards of 700,000 persons, and by the year 1940 will be upwards of 1,640,000. The average amount of sewage flow per twenty-four hours for the said natural drainage area of the Passaic River in the year 1905 is ascertained by the said Commissioners to have been, and so your orators are informed and believe the fact is, 89,343,000 gallons, and by the year 1940 the average amount of sewage flow based on the said estimated population of 1,640,000 is estimated by the said Commissioners at, and so as your orators are informed and believe the fact will be, upwards of 357,365,000 gallons per twenty-four hours.

9 And your orators show that the said Passaic Valley Sewerage Commissioners threaten and intend to build the said

proposed sewer substantially as hereinbefore stated, and intend to gather into it the sewage of the sewerage district aforesaid, and to discharge the same into waters of New York Bay, and that already up to the present time fourteen of the thirty municipalities within the said natural drainage area of the Passaic River have consented to and approved the said project of the said Commissioners, and have agreed to adopt and use the said proposed sewer for the drainage of their respective localities, and that the amount of sewage which they will furnish to the said sewer at the outset is, as your orators are informed and believe, upwards of 120,000,000 gallons per twenty-four hours, which the said Commissioners threaten and intend to discharge into the waters of New York Bay through the mouth of the said sewer. The other municipalities within the said drainage area are intending to adopt and use the said proposed sewer, and the said Commissioners are intending to receive their sewage therein and to discharge the same into the waters of New York Bay. The matter so intended to be discharged contains not only the sewage of the individual inhabitants of the said municipalities, but also the refuse discharged from a great number of manufacturing plants of divers kinds; it is undefecated; it is disagreeable and offensive to the senses; it is poisonous and otherwise injurious to human beings, and to other animal organisms and to fish and oysters, and also is injurious, by its chemical or other action, to wood and metal.

The sewage so deposited in the waters of the bay will, as your orators are informed and believe, be borne by the currents and the tides throughout the bay and into the Hudson and East Rivers, and will be deposited on the bottom and on the shores and about the wharves and docks of the city, and will pollute the said waters and shores, wharves, and docks.

The waters of New York Bay are largely used for bathing by inhabitants of the State of New York, and particularly of the city of New York. The city of New York supports free bath houses, wherein alone 1,800,000 baths were taken in the waters of New York Bay and of the Hudson and East Rivers adjoining the bay in the summer of 1907, besides all other bathers, and the said threatened and intended acts of the defendants, the State of New Jersey and the Passaic Valley Sewerage Commissioners, will render the waters of New York Bay unwholesome and offensive and unsuitable for bathing.

The commerce of the port of New York includes the carriage of a very great number of passengers and of enormous quantities of merchandise upon ocean-going ships engaged in international and in coastwise trade, and on ferry-boats and other vessels plying on the waters of the bay and of the Hudson and East Rivers. All the trans-atlantic liners, and nearly all the other steam ocean-going vessels, and most of the other vessels of all descriptions that enter or leave the port of New York traverse the bay. That for the year ending June 30, 1907, the aggregate value of imports at the port of New York was upwards of $853,000,000, and exports were upwards of $627,000,000 a very large part of the commerce of the whole country, and has very largely contributed to the national revenue

and to the trade and prosperity of the State of New York and of the United States. The wealth and prosperity of the inhabitants of the State of New York, and particularly of the city of New York, have resulted very largely from the commerce of that port. One of the most efficient causes that have obtained for the city of New York this commerce, and one of the most essential elements in retaining it in the future, is the Bay of New York. Anything that tends to make the bay less serviceable or less attractive for commerce tends also to diminish the welfare of the city and of the State, and also to the injury of the whole country.

11 The threatened and intended acts of the defendants herein set forth will, if not restrained, tend, as your orators are informed and believe, to make the Bay of New York less serviceable and less attractive to commerce, by reason, among other things, of the offensive and unwholesome emanations and the unsightly appearance of the water and of the shores, wharves and docks will result from the discharge of sewage in the manner aforesaid into the waters of the bay, and by reason of the injurious action of matter so discharged upon the hulls of vessels, and upon wharves and docks and other structures, and by reason of the dangers of disease and other dangers to which travelers may be exposed, through the pollution of the waters, and otherwise.

Your orators further show that the fisheries of the Bay of New York and of the Hudson River are extensive and valuable. There are in and about the bay large plantations of oysters and large clam beds. Marine fish in great numbers enter the bay from the ocean, and the river and bay are inhabited by other fish. The fisheries supply food to the city of New York, and give employment to many persons. The pollution of the water of the bay by the discharge of sewage into it by the defendants in the manner hereinbefore stated would, as your orators are informed and believe, drive away many of the fish, and would poison and render unfit for food the oysters and clams and others of the fish, and would impair and destroy the value of the fisheries.

And your orators further show that the said threatened and intended acts of the defendants, the State of New Jersey and the Passaic Valley Sewerage Commissioners, if carried out, will injure the health and impair the safety and comfort of the inhabitants of the State of New York, and particularly of the inhabitants of the city of New York, and to travelers and other persons resorting to the city and the said State about their lawful avocations.

12 And your orators further show that the said threatened and intended acts of the defendants, the State of New Jersey and the Passaic Valley Sewerage Commissioners, are in contravention of section 75 of the Public Health Law of the State of New York, a copy of which is annexed hereto marked "Schedule D" and made a part of this bill.

And your orators show that the said threatened and intended acts of the defendants will be repeated and continued from day to day in perpetuity, to the manifest and irreparable injury of your orators and the health, safety, comfort, and welfare of the inhabitants of the

State of New York and of others lawfully within the borders of the State, and your orators are without any adequate remedy at law in the premises.

Forasmuch as your orators can have no relief except in this court, and to the end that the defendants may make full, true, direct and perfect answers to the matters hereinbefore stated and charged, but not under oath, an answer under oath being expressly waived, and may, if they can, show why your orators should not have the relief herein prayed, and that the defendants, their officers, agents, servants, and employees and all other persons acting or pretending to act by or under the authority of the State of New Jersey or of the Passaic Valley Sewerage Commissioners, may be perpetually enjoined and restrained, by writ of injunction issued out of and under the seal of this court, from constructing or causing or permitting to be constructed the sewer and sewage plant and works hereinbefore described, or any part thereof, or any other sewer, sewage plant or works substantially similar thereto in design or in operation or in effect, or designed or intended to conduct into the waters of New York Bay the sewage or drainage of the Passaic Valley sewerage district or of any part thereof, and from receiving into any sewer, sewage plant or works with a view to or for the purpose of discharging the same or any part thereof into the said waters, and from discharging or procuring or suffering to be discharged into the said waters the sewage or drainage of the said district or of any part thereof and from otherwise defiling or polluting the said waters or procuring them to be defiled or polluted by the discharge
13 of sewage, filth, drainage, or other noxious, offensive or injurious matter through any similar system of sewers and why they should not be so enjoined and restrained during the pendency of this cause; and why your orators should not have such other and further relief as in equity and good conscience they may be entitled to, together with their costs;

May it please your honors to grant unto your orators not only a writ of injunction conformable to the prayer of this bill, but also a writ of subpœna of the United States of America, directed to the State of New Jersey, and to the Passaic Valley Sewerage Commissioners, commanding them on a day certain to appear and answer unto this bill of complaint, and to stand to, perform and abide such further order, direction and decree in the premises as to this Honorable Court shall seem meet and agreeable to equity and good conscience.

THE PEOPLE OF THE STATE OF NEW YORK,
By WILLIAM S. JACKSON,
Attorney General.

MAURICE BESSELL DEAN,
Special Counsel.

14 STATE OF NEW YORK,
City and County of New York, ss:

On this 12th day of October, 1908, before me Anna M. Karr, a Commissioner of Deeds of the city of New York, duly commissioned

and sworn, personally appeared William S. Jackson, Attorney General of the State of New York, who being by me duly sworn, said that he is the Attorney General of the State of New York; that he has read the foregoing bill of complaint and knows the contents thereof, and that the same is true of his own knowledge, except as to those matters which are therein stated to be alleged on the information and belief of the complainant, and as to those matters he believes it to be true.

W. S. JACKSON.

Subscribed and sworn to before me this 12th day of October, 1909.

ANNA M. KARR,
Commissioner of Deeds, City of New York.

15 SCHEDULE A.

Chapter 8, Laws of 1834.

An Act to Confirm the Agreement Entered Into by the Commissioners Appointed by This State, and Commissioners Appointed by the State of New Jersey, to Settle the Boundary Line Between New York and New Jersey.

Passed February 5, 1834.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

The agreement entered into between the commissioners appointed by this State, and the commissioners appointed by the State of New Jersey, to settle the boundary line between New York and New Jersey, in the words following, viz:

"Agreement Made Between the Commissioners on the Part of the State of New York and the Commissioners on the Part of the State of New Jersey Relative to the Boundary Line Between the Two States.

"Agreement made and entered into by and between Benjamin F. Butler, Peter Augustus Jay and Henry Seymour, commissioners duly appointed on the part and behalf of the State of New York, in pursuance of an act of the legislature of the said State entitled, 'An act concerning the territorial limits and jurisdiction of the State of New York and the State of New Jersey,' passed, January 18th, 1833, of the one part, and Theodore Frelinghuysen, James Parker and Lucius Q. C. Elmer, commissioners duly appointed on the part and behalf of the State of New Jersey, in pursuance of an act of the legislature of the said State, entitled, 'An act for the settlement of the territorial limits and jurisdiction between the States of New Jersey and New York, passed February 6th, 1833, of the other part.

"Article first. The boundary line between the two States of New York and New Jersey, from a point in the middle of Hudson River

opposite the point on the west shore thereof, in the forty-first
16 degree of north latitude, as heretofore ascertained and marked, to the main sea, shall be the middle of the said river, of the Bay of New York, of the waters between Staten Island and New Jersey, and of Raritan Bay, to the main sea, except as hereinafter otherwise particularly mentioned.

"Article second. The State of New York shall retain its present jurisdiction of and over Bedlow's and Ellis' islands, and shall also retain exclusive jurisdiction of and over the other islands lying in the waters above mentioned, and now under the jurisdiction of that State.

"Article third. The State of New York shall have and enjoy exclusive jurisdiction of and over all the waters of the Bay of New York, and of and over all the waters of Hudson River lying west of Manhattan Island and to the south of the mouth of Spuyten Duyvel Creek, and of and over the lands covered by the said waters to the low-water mark on the westerly or New Jersey side thereof; subject to the following rights of property and of jurisdiction of the State of New Jersey, that is to say:

"1. The State of New Jersey shall have the exclusive right of property in and to the land under water lying west of the middle of the Bay of New York and west of the middle of that part of the Hudson River which lies between Manhattan Island and New Jersey.

"2. The State of New Jersey shall have the exclusive jurisdiction of and over the wharves, docks and improvements made, and to be made, on the shore of the said State, and of and over all vessels aground on said shore or fastened to any such wharf or dock; except that the said vessels shall be subject to the quarantine or health laws, and laws in relation to passengers, of the State of New York, which now exist or which may hereafter be passed.

"3. The State of New Jersey shall have the exclusive right of regulating the fisheries on the westerly side of the middle of the said waters, provided that the navigation be not obstructed or hindered.

"Article fourth. The State of New York shall have exclusive jurisdiction of and over the waters of the Kill Van Kull, between Staten Island and New Jersey, to the westernmost end of Shooters' Island, in respect to such quarantine laws and laws relating to passengers as now exist or may hereafter be passed under the authority of that State, and for executing the same; and the said State shall also have exclusive jurisdiction, for the like purposes, of and over the
17 waters of the sound, from the westernmost end of Shooter's Island to Woodbridge Creek, as to all vessels bound to any port in the said State of New York.

"Article fifth. The State of New Jersey shall have and enjoy exclusive jurisdiction of and over all the waters of the sound between Staten Island and New Jersey, lying south of Woodbridge Creek, and of and over all the waters of Raritan Bay lying westward of a line drawn from the lightthouse at Prince's Bay to the mouth of Mattawan Creek, subject to the following rights of property and of jurisdiction of the State of New York:

"1. The State of New York shall have the exclusive right of prop-

erty in and to the land under water, lying between the middle of the said waters and Staten Island.

"2. The State of New York shall have the exclusive jurisdiction of and over the wharves, docks and improvements made and to be made, on the shore of Staten Island; and of and over all vessels aground on said shore, or fastened to any such wharf or dock, except that the said vessel shall be subject to the quarantine or health laws, and laws in relation to passengers of the State of New Jersey which now exist, or which may hereafter be passed.

"3. The State of New York shall have the exclusive right of regulating the fisheries between the shore of Staten Island and the middle of the said waters, provided that the nevigation of the said waters be not obstructed or hindered.

"Article sixth. Criminal process issued under the authority of the State of New Jersey, against any person accused of an offense committed within that State; or committed on board of any vessel being under the exclusive jurisdiction of that State as aforesaid; or committed against the regulations made or to be made by that State, in relation to the fisheries mentioned in the third article; and also civil process issued under the authority of the State of New Jersey against any person domiciled in that State, or against property taken out of that State to evade the laws thereof; may be served upon any of the said waters within the exclusive jurisdiction of the State of New York, unless such person or property shall be on board a vessel aground upon, or fastened to the shore of the State of New York, or fastened to a wharf adjoining thereto; or unless such person shall be under arrest, or such property shall be under seizure, by virtue of process or authority of the State of New York.

18 "Article seventh. Criminal process issued under the authority of the State of New York, against any person accused of an offense committed within that State; or committed on board of any vessel being under the exclusive jurisdiction of that State as aforesaid; or committed against the regulations made or to be made by that State, in relation to the fisheries mentioned in the fifth article; and also civil process issued under the authority of the State of New York, against any person domiciled in that State, or against property taken out of that State to evade the laws thereof; may be served upon any of the said waters within the exclusive jurisdiction of the State of New Jersey, unless such person or property shall be on board a vessel aground upon, or fastened to the shore of the State of New Jersey, or fastened to a wharf adjoining thereto; or unless such person shall be under arrest, or such property shall be under seizure, by virtue of process or authority of the State of New Jersey.

"Article eight. This agreement shall become binding on the two States when confirmed by the legislatures thereof respectively, and when approved by the Congress of the United States.

"Done in four parts (two of which are retained by the Commissioners of New York, to be delivered to the Governor of that State, and the other two of which are retained by the Commissioners of New Jersey, to be delivered to the Governor of that State), at the

city of New York, this sixteenth day of September, in the year of our Lord on thousand eight hundred and thirty-three, and of the independence of the United States, the fifty-eighth.

"(Signed)

"B. F. BUTLER.	THEO. FRELINGHUYSEN.
"PETER AUGUSTUS JAY.	JAMES PARKER.
"HENRY SEYMOUR.	LUCIUS Q. C. ELMER."

is hereby ratified and confirmed on the part of the State of New York.

19 SCHEDULE B.

Chapter 48, *Laws of* 1902.

An Act to Create a Sewerage District to be Called Passaic Valley Sewerage District.

Be it enacted by the Senate and General Assembly of the State of New Jersey:

1. All that portion of Essex, Passaic, Bergen and Hudson counties beginning in the center of Newark Bay where the boundary line between the cities of Newark and Elizabeth meets the boundary line between the Counties of Essex and Hudson; thence running westerly along the boundary line between the city of Newark and the city of Elizabeth, running up Bound Creek to the boundary line between the township of Clinton and the city of Newark; thence running westerly between the boundary line of the city of Newark and the township of Clinton to the intersection of Clinton Place and Hawthorne Avenue; then running southerly still along said boundary line to the center of Nye Avenue; thence running westerly along said center of Nye Avenue to a point one hundred feet easterly from Hobson Street, thence running southerly parallel to Hobson Street and one hundred feet easterly therefrom to a point two hundred feet northerly of Bragaw Avenue; thence running northerly parallel with Bragaw Avenue, and two hundred feet northerly therefrom, to a point halfway between Hobson Street and Leslie Street; thence running southerly half way between said streets to the center of Bragaw Avenue; thence running westerly along the center of Bragaw Avenue to a point half way between Wainwright Street and Schley Street; thence running northerly half way between said streets to a point three hundred feet northerly from Bragaw Avenue; thence running westerly parallel to Bragaw Avenue, and three hundred feet northerly therefrom, and in a westerly prolongation of said line, to a point half way between Schley Street and Fabyan Place; thence running northerly half way between Schley Street and Fabyan Place to the center of Nye Avenue; thence running westerly along the center of Nye Avenue to the boundary line between the city of Newark and the town of Irvington; thence running northerly along said boundary line between Newark and Irvington to a point one hundred feet south of Avon Avenue; thence

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running easterly parallel to Avon Avenue, and one hundred feet southerly therefrom, to a point half way between South Twentieth Street and South Nineteenth Street; thence running northerly half way between said streets to a point one hundred feet northerly of Woodland Avenue; thence running easterly parallel to Woodland Avenue and one hundred feet northerly therefrom, to a point half way between South Nineteenth and South Eighteenth Street-; thence running northerly half way between said streets to a point one hundred feet southerly of Eighteenth Avenue; thence running easterly parallel with said Eighteenth Avenue, and one hundred feet southerly therefrom, to a point half way between Eighteenth Street and Seventeenth Street; then running northerly half way between said streets to a point two hundred feet northerly from Eighteenth Avenue; thence running easterly parallel to Eighteenth Avenue, and two hundred feet northerly therefrom, to a point one hundred feet easterly from Seventeenth Street; thence running northerly parallel to Seventeenth Street, and one hundred feet easterly therefrom to a point two hundred feet southerly from Fifteenth Avenue, and two hundred feet southerly therefrom, to a point half way between Sixteenth Street and Fifteenth Street; thence running northerly half way between Sixteenth Street and Fifteenth Street to a point one hundred feet northerly from Fourteenth Street; thence running easterly parallel with Fourteenth Avenue, and one hundred feet northerly therefrom, to a point half way between Fifteenth Street and Fourteenth Street; thence running northerly half way between said streets to a point three hundred feet northerly from Fourteenth Avenue; thence running easterly and parallel with Fourteenth Avenue, and three hundred feet northerly therefrom, to a point one hundred feet westerly from Ashland Avenue; thence running northerly parallel with Ashland Avenue, and one hundred feet westerly therefrom to the north side of South Orange Avenue; thence running westerly along said north side of South Orange Avenue to the east side of South Eighteenth Street; thence running northerly along said east side of South Eighteenth Street to a point
in range of a line half way between Twelfth Avenue and
21 Thirteenth Avenue; thence running westerly half way between said avenue to a point half way between South Nineteenth and South Twentieth Street-; thence running southerly half way between said streets to a point one hundred feet northerly from Thirteenth Avenue; thence running westerly parallel to Thirteenth Avenue, and one hundred feet northerly therefrom, to the boundary line between the city of Newark and the borough of Vailsburgh; thence running northerly along said boundary line between the city of Newark and the borough of Vailsburgh to the boundary line between the city of East Orange and the borough of Vailsburgh; thence westerly along the boundary line between the city of East Orange and the borough of Vailsburgh to an angle therein; thence running southerly still along said boundary line to another angle in said line in South Orange Avenue; thence running westerly still along said boundary line and South Orange Avenue to a third angle; thence running northerly still

along said boundary line to a fourth angle; thence running westerly still along said boundary line between the city of East Orange and the borough of Vailsburgh and the boundary line between the city of East Orange and the village of South Orange to a point in the boundary line between the city of Orange and the village of South Orange; thence running westerly along said boundary line between the city of Orange and the village of South Orange to the boundary line of the town of West Orange; thence running northerly along the boundary line between the town of West Orange and the city of Orange to the boundary line of the town of Montclair; thence westerly along the boundary line between the town of West Orange and the town of Montclair to an angle; thence running northerly further along said boundary line between West Orange and Montclair to the boundary line of the township of Verona; thence running northerly along the boundary line between Verona and Montclair to the boundary line of the township of Little Falls; thence running easterly along the boundary line between the township of Little Falls and the town of Montclair to the boundary line of the township of Acquackanonck; thence running northerly along the boundary line between the township of Little Falls and Acquackanonck Township to the southerly boundary of the city of Paterson; thence northwesterly along the same to a point in the Passaic River
22 where the said southerly boundary line of the city of Paterson would intersect the dividing line between the city of Paterson and Totowa Borough; thence northwesterly along said dividing line to the northwesterly boundary line of the city of Paterson; thence following the various courses of the northerly boundary line of the city of Paterson to the center of the Passaic River; thence along the center of said river to the northerly boundary line of the borough of Garfield; thence easterly and southerly along the several courses of the boundary line of the borough of Garfield to a point where said boundary line is intercepted by the northeasterly corner of the boundary line of the borough of Wallington; thence southerly along the easterly boundary line of the borough of Wallington to Hoboken Street on the boundary line between the boroughs of Wallington and East Rutheford; thence southeasterly along said line to a point where Hoboken Street is intersected by Montross Avenue; thence southwesterly along the center of Montross Avenue to the boundary line between the boroughs of East Rutheford and Rutheford; thence southerly along the center of Montross Avenue to the center of Washington Avenue; thence northwesterly along the center of Washington Avenue to Prospect Place, thence southwesterly along the center of Prospect Place to Union Avenue; thence southwesterly in prolongation of the line of the center of Prospect Place and parallel to Carmita Avenue to a point where said line would be intersected by the center line of Fairview Avenue if prolonged northwesterly; thence southeasterly to the southeasterly side of Montross Avenue; thence southeasterly along the center of Fairview Avenue three hundred and fifty feet; thence southwesterly parallel to the center line of Montross Avenue to the center line of Passaic Avenue; thence

southerly in a straight line to a point two hundred and fifty feet westerly from Mortimer Avenue midway between Donaldson and Woodland avenues; thence southeasterly parallel to Donaldson Avenue to the center of Mortimer Avenue; thence southerly along the center of Mortimer Avenue to the center of Park Place; thence easterly along the center of Park Place to the intersection of Park Place and Wheaton Place; thence southwesterly along the center of Wheaton Avenue to the center line of Pierrepont Avenue; thence southeasterly along the center of Pierrepont Avenue to its intersection with the center line of Ridge Avenue; thence southwesterly along said Ridge Avenue to the center line of Woodland
23 Avenue; thence southeasterly along the center of Woodland Avenue to the center line of Sylvan Street; thence southwesterly along the center of Sylvan Street to the center line of Van Riper Avenue; thence southerly in a straight line to the intersection of the center lines of Summit and Rutheford avenues in the boundary line between the borough of Rutheford and the township of Union; thence southwesterly in a straight line to the intersection of the center line of Cromwell and Kingsland avenues; thence southwesterly along the said line of Cromwell Avenue to Jauncey Avenue in the borough of North Arlington; thence still southwesterly along the center of Cromwell Avenue to a point one hundred feet northerly of the Jersey City and Belleville Turnpike; thence running southeasterly parallel with said turnpike and one hundred feet northeasterly therefrom, to a point measuring southeasterly along said line five thousand feet southeasterly from its intersection with the center line of the New York and Greenwood Lake Railroad; thence running southerly to a point in the Newark plank road, which point is one thousand eight hundred and fifty feet measuring easterly along said plank road from the center of the draw on said road over the Passaic River; thence running southerly to a point on the Newark and New York Railroad, which point is one thousand eight hundred and fifty feet, measuring easterly along said railroad, from the center of the draw over the Passaic River on said railroad; thence running southerly in a prolongation of said last described course to its intersection with the easterly boundary of the city of Newark in Newark Bay; thence running southerly along said boundary of the city of Newark to the point of beginning, shall be and is hereby constituted a sewerage district under the name and title of Passaic Valley Sewerage District, and it shall be entitled to all of the authority and shall be subject to all the laws of this State concerning sewerage districts so created.

2. This act shall take effect immediately.

Approved March 27, 1902.

SCHEDULE C.

Chapter 10, *Laws of* 1907.

An Act to provide for the purification of the waters of the Passaic River within the Passaic Valley Sewerage District, prohibiting the discharge of sewage or other polluting matter into said portion of said river after a fixed date, and authorizing municipalities lying in whole or in part within the Passaic Valley Sewerage District, from the territory of which sewage or other polluting matter is or may be discharged into said portion of said river, to enter into contracts with each other and with the Passaic Valley Sewerage Commissioners for the intercepting and disposal of such sewage and other polluting matter, and to provide the necessary funds therefor.

Whereas, a large number of municipalities and the inhabitants thereof are now discharging sewage and other polluting matter into the waters of the Passaic River within the Passaic Valley Sewerage District, between the Great Falls at the city of Paterson and the mouth of the Passaic River at Newark Bay and said waters are thereby polluted; and

Whereas, in order to purify said portion of said river, it is necessary that power be granted to said municipalities to adopt some method to prevent the discharge of sewage and other polluting matter into said portion of said river by mutual co-operation, and that a reasonable time be granted within which to provide the necessary means for intercepting and disposing of said sewage and other polluting matter:

Be it enacted by the Senate and General Assembly of the State
or indirectly, discharge sewage or otherpolluting matter into the
1. Every municipality, corporation and individual is hereby prohibited and forbidden to discharge, directly or indirectly, any sewage or other polluting matter into the waters of the Passaic River at any point between the Great Falls in the city of Paterson and the mouth of the said river at Newark Bay, or into any tributaries of the Passaic River which empty into the Passaic River between said points, after the twelfth day of December, in the year one thousand nine hundred and twelve; and the Passaic Valley Sewerage
25 Commissioners are hereby authorized and empowered to enforce the provisions of this act over and throughout all municipalities which may, or the inhabitants of which may, directly or indirectly, discharge sewage or other polluting matter into the waters of the Passaic River between the points above designated, or into the tributaries aforesaid, after the said twelfth day of December, one thousand nine hundred and twelve.

The Passaic Valley Sewerage Commissioners are hereby authorized and directed, within thirty days after the approval of this act, to notify each municipality from which sewage or other polluting

matter is or may be discharged into the said river between said points, either directly or indirectly, and the inhabitants thereof, that the discharge of sewage and other polluting matter into the waters of the said river must be discontinued on or before the twelfth day of December, in the year one thousand nine hundred and twelve. Such notice shall be in writing, signed by the president and secretary of the Passaic Valley Sewerage Commissioners, and shall be served upon the clerk or the equivalent officer of every such municipality, and shall be published in one of the newspapers printed and circulating in the counties of Passaic, Bergen, Hudson and Essex, for two consecutive weeks, once in each week, such public notice to be in the following form:

To whom it may concern:

Public notice is hereby given that the discharge of sewage and other polluting matter into the waters of the Passaic River at any point between the Great Falls, at the city of Paterson, and Newark Bay, and into the tributaries of the said river emptying therein between said points, is prohibited and must cease and be discontinued after December twelfth, in the year one thousand nine hundred and twelve.

The Passaic Valley Sewerage Commissioners are further authorized and empowered to institute in their corporate name suits at law or in equity, as may be deemed necessary or appropriate to enforce the provisions of this section of the act after said twelfth day of December, in the year one thousand nine hundred and twelve; and the court of chancery of this State is hereby vested with special jurisdiction to enforce the provisions of this section of this act in a summary manner upon application of the Passaic Valley Sewerage Commissioners.

26 2. The governing body or board having charge of finances of any municipality or municipalities, lying in whole or in part within the Passaic Valley Sewerage District may, by resolution, determine that it is advisable and to the interest of such municipality or municipalities, in order to comply with the provisions of this act, to cause the sewage and other polluting matter discharging or which may be discharged into the waters of the Passaic River, from its or their territory, within the Passaic Valley Sewerage District, to be intercepted by a trunk or main intercepting sewer or sewers, and to be conducted to a safe and proper place for discharge and disposal, and there to be discharged and disposed of; and may further, by said resolution, request the Passaic Valley Sewerage Commissioners to prepare and submit maps, plans and specifications, for the construction of a joint trunk or main intercepting sewer or sewers, and of the necessary works for the discharge and disposal of sewage and other polluting matter, at some safe and proper place or places, together with an estimate of the probable cost of such construction and of the operation and maintenance thereof, and of obtaining the necessary property rights for the construction thereof, and also an estimate of the sewage capacity in said trunk sewer or sewers, required by each municipality lying in whole or in part

within said sewerage district. Also, an estimate of the proportion of said cost of construction, as near as may be, which would be apportioned to each of said municipalities, upon the basis expressed in section four of this act. The municipality making such request shall, in and by said resolution, agree to pay the said Passaic Valley Sewerage Commissioners the cost, not exceeding ten thousand dollars ($10,000); of preparing such maps, plans, specifications and estimates so requested.

And such municipality shall, at the time of making such request, pay as part of said expenses the sum of five thousand dollars ($5,000) to the Passaic Valley Sewerage Commissioners, which said moneys the said municipality is authorized to appropriate and pay from any fund or balance not otherwise appropriated; and it is also further authorized to raise by temporary loans, notes or bonds, said sums so to be advanced and paid by said municipality, which shall be repaid to it, with interest at the rate of five per centum per annum, when contract, as hereinafter provided, shall have been entered into for the building of said sewer, sewers, plant or works.

27 3. Upon receiving a copy of such resolution or resolutions, authenticated by the clerk or other like officer of any one or more of such municipalities, the Passaic Valley Sewerage Commissioners shall forthwith prepare the said maps, plans and specifications and estimates, so requested, and copies thereof shall be delivered by the clerk of the Passaic Valley Sewerage Commissioners, to each of the clerks or other like officers of all the municipalities, lying in whole or in part within the Passaic Valley Sewerage District.

An accurate record of the time and manner of the delivering of said copies by the clerk of the Passaic Valley Sewerage Commissioners to the clerks of said municipalities shall be made by the clerk of the Passaic Valley Sewerage Commissioners, and entered upon the minutes of said boards, and a like record shall be kept by the clerks of the said municipalities and shall be entered upon the minutes of the boards or bodies having charge of the finances in said municipalities respectively.

In preparing the maps, plans and specifications for the intercepting sewer or sewers, plant or works, to be made by the said commissioners as herein provided, and in making the estimate of the sewage capacity required for each municipality, regard shall be had by the said commissioners both to area and population to be provided for, making provision, however, for not more than ten per centum of the factory waste and excluding all waste from gas works, and all substances or discharges which may injuriously affect the integrity of the sewer or sewers when constructed.

4. Any two or more of said municipalities, at any time after the expiration of three months from the date of the said delivery of copies of said maps, plans, specifications and estimates to all of the said municipalities lying in whole or in part within the said sewerage district, are hereby authorized and empowered, by resolution of their governing bodies or boards having charge of their finances, to enter into a contract in writing with each other and with the

Passaic Valley Sewerage Commissioners, in their corporate capacities, for the construction, maintenance and operation of said sewer or sewers, plant or works, with the appurtenances, or of so much thereof as may be necessary and appropriate for the contracting municipalities, together with works, machinery, appliances and other things requisite or useful for the purposes to be accom-
28 plished by such intercepting sewer or sewers, and for the purchase of lands, rights in lands and other property requisite or useful therefor.

The contract herein authorized shall generally describe the route, line, size and capacity of such intercepting sewer or sewers, and shall fix the percentage of the capacity therein, to the use of which each of the contracting municipalities shall be entitled, together with the percentage of the cost and expense of construction, repair, maintenance and operation of the same to be paid by each of the contracting municipalities. The cost of the construction of said sewer or sewers, plant and works shall in said contract be apportioned to the respective municipalities entering into the contract in such proportion as the taxable property, real and personal, within so much of said municipality so contracting as is embraced in said sewerage district, bears to the total amount of taxable property, real and personal, within so much of all the municipalities so contracting as is embraced within said sewerage district, as returned and certified by the respective taxing boards and taxing officers of the said municipalities for the year one thousand nine hundred and seven.

Provided, however, That all taxable property, real and personal, for this purpose, be assessed at its true value, and it shall be the duty of each assessor, taxing board and taxing officer, for the several municipalities so contracting, for this purpose to examine, compute and determine, and certify to said sewerage board on or before the first day of October, one thousand nine hundred and seven, the amount of taxable property, real and personal, assessed for the year one thousand nine hundred and seven, to and upon persons and property within so much of the several municipalities so contracting as lie within the said sewerage district; and the books of each of said assessors, taxing boards and taxing officers shall at all times be open for examination to the Board of Sewerage Commissioners and to the contracting municipalities, its and their officers and agents, for the purpose of examining, checking and verifying said certificates.

In case any contracting municipality shall request sewage capacity in excess of what would be allotted to it for sewage, including ten per centum of factory waste, provision may in said contract be made for the enlargement of said sewer or sewers, plant and works, in order to accommodate, take care and dispose of a larger quantity of factory waste, such increase in accommodation to be made at the expense of the municipality making requisition therefor.

29 The cost of maintenance, repair and operation of said sewer or sewers, plant and works shall, by the terms of said contract, be apportioned annually to the respective municipalities entering into said contract, according to the amount of sewage by them re-

specitively delivered or discharged into any sewer or sewers or other receptacles provided or constructed by the said sewerage commissioners for the reception of the same.

The said contract shall provide for the construction by the Passaic Valley Sewerage Commissioners of an intercepting sewer or sewers, plant and works, reasonably sufficient in size and capacity to intercept and dispose of sewage and other polluting matter of the contracting municipalities for the present, and, so far as can be estimated and foreseen, for the future, and said sewer or sewers, plant and works may differ substantially in details from the preliminary maps, plans, specifications and estimates submitted to the municipalities as hereinbefore directed.

And the several contracting municipalities and the Passaic Valley Sewerage Commissioners are hereby vested with absolute discretion in the determination of the size and capacity of such intercepting sewer or sewers, plant and works.

Any contract made or entered into pursuant to the provisions of this act shall provide for the building, repairing, operating, maintaining and cleaning of any such intercepting sewer or sewers, plant and works, and for the purchase of the necessary lands, rights in land and other property by the Passaic Valley Sewerage Commissioners, and for the payment of the cost and expense thereof by the several contracting municipalities to the said commissioners.

The total cost and expense of constructing said intercepting sewer or sewers, plant and works, shall include as a part thereof the expenses of the Passaic Valley Sewerage Commissioners heretofore incurred and not otherwise provided for, not exceeding the sum of twenty-five thousand dollars ($25,000), also the cost of preliminary maps, plans, specifications and estimates herein referred to; also, the salary or other compensation of the said commissioners up to the completion of said intercepting sewer or sewers, plant and works, together with all incidental expenses of maintaining their corporate organization and clerical and engineering services, and the reasonable compensation of counsel which they are hereby authorized to employ.

The cost and expense of maintaining, repairing and operating said intercepting sewer or sewers, works and plant, shall include as a part thereof the salaries or other compensation of the said commissioners, also charges for clerical and engineering services, compensation of counsel and incidental expenses of maintaining their corporate organization.

In all the contracts to be made between the municipalities and the Passaic Valley Sewerage Commissioners, pursuant to the terms of this act, the several municipalities so contracting shall undertake and agree, upon the request of the Passaic Valley Sewerage Commissioners, to exercise and put in operation all their powers of eminent domain for the condemnation of lands, rights in lands and other property for the benefit of such joint enterprise, either within or outside the territory of such contracting municipalities.

Upon the making of the contract hereby authorized the Passaic Valley Sewerage Commissioners shall have full power in their own

corporate name to purchase and acquire all lands, rights and interests in lands, either within or outside the territory of the joint contracting municipalities, which may be necessary for the construction of such intercepting sewer or sewers, and its appurtenances, and for this purpose are authorized to condemn the same in the manner provided by the general laws of this State relating to the condemnation of lands for public use.

Upon the making of such contract the Passaic Valley Sewerage Commissioners are further authorized and empowered to erect, construct, maintain, and operate such intercepting sewer or sewers and appurtenances, together with all works, machinery, appliances, and other things requisite or useful for the purposes to be accomplished by the same.

It shall be lawful for the Passaic Valley Sewerage Commissioners, in the execution of said works, to build and construct said intercepting sewer or sewers and the necessary appurtenances thereto, to the point or points of discharge and disposal determined by said contract, and for this purpose to pass through or partly through territory situated within the bounds of any other municipality than those contracting with it for the construction of said work, and they shall have full power to construct such intercepting sewer or sewers, and its appurtenances, along, under, and over any water-course, or under or over or along or across any street, turnpike, road, railroad,
highway or other way, or public park or grounds, and in or
31 upon private or public land under water; in such way and manner, however, as not necessarily to obstruct or impede travel or navigation, and may enter upon and dig up any street, highway or private or public land, for the purpose of constructing said work and appurtenances and for repairing and maintaining the same, and in a general way to do all other acts and things necessary, convenient, and proper in connection with the making and maintaining of the improvement contemplated by the provisions of this act. The highways dug up and disturbed shall be restored to their former condition as near as may be.

Whenever any work to be performed or material to be furnished shall involve an expenditure of any sum of money exceeding the sum of two thousand dollars ($2,000) the Passaic Valley Sewerage Commissioners shall designate the time when they will meet at their usual place of meeting to receive proposals in writing for doing the work and furnishing the material; and said Commissioners shall order its clerk to give notice by advertisement inserted in at least two newspapers printed and circulating, respectively, in two of the counties of said district, at least ten days before the time of such meeting, of the work to be done and material to be furnished, of which at the time of such order they shall cause to be filed in their office particular specifications.

All proposals received shall be publicly opened by the said Commissioners and the Commissioners shall award the contract to the lowest responsible bidder; all contractors shall be required to give bond satisfactory in amount and security to the Passaic Valley Sewerage Commissioners.

6. For the purpose of defraying the cost and expense of the construction of such intercepting sewer or sewers, plant and works, and appurtenances, and of making the payments which shall be designated and required to be made by such joint contract, the governing body or board in charge of the finances of each contracting municipality is hereby authorized and empowered to borrow the money necessary to make such payments upon the notes or other temporary obligations of such municipality, which notes or obligations may be renewed from time to time until permanent bonds shall have been issued by such municipality to take up and pay for the same.

And each contracting municipality shall have the power and is hereby authorized, from time to time to issue its bonds for
32 the purpose of raising money necessary to pay its notes or other temporary obligations, including interest, issued and outstanding for the purpose hereinbefore stated, or to make any of the payments required by the said contract, which said bonds shall be in such amounts and bear interest at such rate, not exceeding six per centum per annum, and shall be payable at such time and place as the governing body or board having charge of the finances of such municipality shall by resolution, duly adopted, determine.

The total amount of indebtedness incurred and of bonds issued by any municipality under the authority of this act shall not exceed five per centum of the tax ratables within such municipality, as shown by its official books of the last assessment for taxes therein, but said indebtedness and bonds shall be held to be authorized in addition to the amount of indebtness and bonds fixed by the charter or general act as a limitation beyond which such municipality may not incur indebtedness or issue bonds, and said indebtedness and bonds authorized by this act shall not be taken to be included within or governed by any such limitation.

Upon the making of any such contract as is herein provided for the Passaic Valley Sewerage Commissioners are authorized and empowered to borrow upon their corporate notes, or other temporary obligations, any moneys which may be required by them in the performance of the said contract, for the payment of which moneys so borrowed said contract with the several municipalities executing the same shall be security.

8. Any time after the making of a contract in accordance with the provisions hereof, the Passaic Valley Sewerage Commissioners may, with the consent of the municipalities which have contracted with them, enter into further contract or contracts, with any other municipality, or person or corporation, for the use of the said intercepting sewer or sewers and appurtenances, and for participation in the benefits and in the cost of construction, operation and maintenance of the same, upon such terms and conditions as may be agreed upon in any such contract or contracts.

And the said last-mentioned municipality or municipalities shall have like power to borrow money, make and issue notes or other temporary obligations and bonds, as is given by this act to the

municipalities first entering into contract with the Passaic Valley Sewerage Commissioners.

9. Upon the completion of such intercepting sewer or
33 sewers, plant and works, and appurtenances, the Passaic Valley Sewerage Commissioners are authorized and directed to retain and have the sole control and charge of the said sewer or sewers, plant and works, and appurtenances and every municipality using such intercepting sewer or sewers, plant and works, is hereby required to pay annually to the Passaic Valley Sewerage Commissioners, on demand, its proportion of the cost of maintenance and operation of the same, as the same may be certified to it from time to time by the Passaic Valley Sewerage Commissioners, pursuant to the terms of said contract, which said cost of maintenance and operation shall be raised and provided for by the said municipalities by taxation or by the issue of temporary loan bonds in anticipation of taxation.

In case the sewer or sewers, plant or works, first contracted to be built under this act shall not be built and put in practical operation by the twelfth day of December, one thousand nine hundred and ten, then and in that case the municipalities lying in whole or in part within the Passaic Valley Sewerage District, and not entering into contract with the Passaic Valley Sewerage Commissioners for the construction of an intercepting sewer or sewers, plant or works under this act, shall have two years from the time within which such sewer or sewers shall be put into practical operation within which to cease to discharge all sewage and other polluting matter into the said portion of the said river.

It shall be the duty of the Comptroller of this State to cause the accounts of the Passaic Valley Sewerage Commissioners to be annually audited at the expense of the Passaic Valley Sewerage Commissioners, and the result of such audit shall be printed with the financial report of the Passaic Valley Sewerage Commissioners. The said Board of Sewerage Commissioners shall at all times keep full and accurate account of its receipts and expenditures and liabilities, and shall annually cause a detailed statement thereof to be published and a copy thereof mailed to the clerk of each of the contracting municipalities. Said commissioners shall be liable for any unlawful act, as are now members or officers of any public body, and no commissioner shall be, directly or indirectly interested in any contract awarded under the provisions of this act, or in furnishing material, or supplies therefor to any contractor, or in furnishing security for the performance of any contract.

In case the city of Paterson shall, pursuant to the pro-
34 visions of this act, enter into contract with the Passaic Valley Sewerage Commissioners for the construction of an intercepting sewer or sewers, plant and works and appurtenances, then and in that case the said city shall turn over to the Passaic Valley Sewerage Commissioners all plans, maps, data and reports which it may have produced, purchased or secured, and which it may now own relating to the subject of sewerage and sewage disposal, and the Passaic Valley Sewerage Commissioners shall credit

to the city of Patterson therefor on said contract the sum of eight thousand dollars ($8,000), and the said sum shall be taken to be a part of the construction cost of said sewer or sewers, plant and works.

10. In case, for any reason, any section or provision of this act shall be questioned in any court, and shall be held to be unconstitutional or invalid, the same shall not be held to affect any other section or provision of this act.

11. For the purpose of removing any doubt which may exist as to the corporate power and authority of the Passaic Valley Sewerage Commissioners to enter into and perform the contracts herein and hereby authorized, and to execute and perform the duties herein imposed upon the said Commissioners, the said Passaic Valley Sewerage Commissioners heretofore appointed, and their successors in office, are and shall continue to be a body politic and corporate, with perpetual succession under the name of Passaic Valley Sewerage Commissioners, with power to sue and be sued, with power to adopt and use a corporate seal, and with the right, power and authority to acquire, hold, use and dispose of all such property, real or personal, as may be proper or necessary, and with all other power or authority proper or necessary to carry out and effectuate the purposes for which the said board is created.

12. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

13. This act shall take effect immediately.

Approved March 18, 1907.

25 SCHEDULE D.

Section 75, Public Health Law.

§75. Discharge of Sewage and Other Refuse Matter in Certain Waters Prohibited.—No person, corporation or municipality, shall place or cause to be placed, or discharge or cause to be discharged into any of the waters of this State, unless the same shall have been permitted by the State Commissioner of Health, any sewage, garbage, offal, dead animal, dead fish, dead bird or part thereof, or any decomposable or putrescible matter of any kind, or any substance, chemical or otherwise, containing the same in quantities injurious to the public health, or any refuse or waste matter, either solid or liquid, in quantities injurious to the public health, from any shop, factory, mill or industrial establishment; unless express permission to do so shall have been first given in writing by the State Commissioner of Health as provided in this article, except as hereinafter provided. But this act shall not prevent the discharge of sewage from any public sewer system owned and maintained by a municipality, or the discharge of refuse or waste matter from any shop, factory, mill or industrial establishment, provided such sewer system was in operation and was discharging sewage, or such shop, factory, mill or industrial establishment was

in operation and discharging refuse or waste matter, into any of the waters of this State at or prior to the time of the passage of this act, nor to any extension or modification of such shop, factory, mill or industrial establishment or reconstruction thereof, provided the refuse or waste matter discharged therefrom is not materially changed or increased; but this exception shall not permit any increase in the discharge of such sewage, nor shall it permit the discharge of sewage from a sewer system which shall be extended, modified or reconstructed subsequent to the pasage of this act.

[Endorsed:] In the Supreme Court of the United States. The People of the State of New York, complainants, against State of New Jersey and Passaic Valley Sewerage Commissioners, defendants. Bill of complaint. In equity. No. —, original. Maurice B. Dean, special counsel, attorney for complainant, 29 Broad Street, borough of Manhattan, city of New York.

[Endorsed:] Supreme Court of the United States, October
36 Term, 1908. No. 9, Original. The People of the State of New York, complainants, vs. State or New Jersey and Passaic Valley Sewerage Commissioners, defendants. Bill of Complaint. Filed Oct. 17th, 1908.

And on the same day, to-wit: On the 17th day of Octo-
37 ber, A. D. 1908, order for appearance of complainants was filed in words and figures following, viz.:

Order for Appearance.

Supreme Court of the United States, October Term, 1908.

No. 9, Orig'l.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY et al.

The Clerk will enter my appearance as Counsel for the Complainants.

(Name:) MAURICE B. DEAN,
(P. O. Address:) 20 *Broad Street, New York City.*

NOTE.—Must be signed by a member of the Bar of the Supreme Court of the United States. Individual and not firm names must be signed.

Endorsed: Supreme Court U. S. October Term, 1908. Term No. 9, Original. Appearance for Compl't. Filed Oct. 17th, 1908.

And on the same day, to-wit: On the 17th day of October, A. D. 1908, a subpœna was issued to the Marshal for service on defendants.

And afterwards, to-wit: On the 17th day of November,
38 A. D. 1908, a subpœna with Marshal's return was filed in the words and figures following, viz:

THE UNITED STATES OF AMERICA, *ss:*

[SEAL.]

The President of the United States to State of New Jersey and Passaic Valley Sewerage Commissioners, Greeting:

For certain causes offered before the Supreme Court of the United States, having jurisdiction in equity, you are hereby commanded that, laying all other matters aside and notwithstanding any excuse you be and appear before the Supreme Court, holding jurisdiction in equity, on the first Monday in January next, at the City of Washington in the District of Columbia, being the seat of the National Government of the United States, to answer unto a bill of complaint of the People of the State of New York, in the said Court exhibited against you.

Hereof you are not to fail at your peril.

Witness the Honorable Melville W. Fuller, Chief Justice of the United States, at the City of Washington, the sevententh day of October, A. D. 1908.

JAMES H. McKENNEY,
Clerk of the Supreme Court of the United States.

Came to my hand the 17th day of October, 1908. Re-
39 turned executed by acceptance of service of the several named defendants herein as witnesses by their writing and signatures hereon. This seventh day of November, A. D. 1908.

J. M. WRIGHT,
Marshal, Supreme Court of the United States.

40 Due and legal service hereof is admitted for the def't, the State of New Jersey.

JOHN FRANKLIN FORT, *Governor.*
ROBERT H. McCARTER, *Attorney General.*

Due and legal service hereof is admitted for the def't, the Passaic Valley Sewerage Commissioners.

J. A. LEBKUECHER, *Chairman.*

Endorsed: Supreme Court U. S. October Term, 1908. Term No. 9 Original. The People of the State of New York, Compl'ts, vs. State of New Jersey et al. Subpœna. Filed November 7th, 1908.

41 And afterwards, towit, on the 4th day of January A. D. 1909, the following entry appears of record, viz:

9. Original.

PEOPLE OF THE STATE OF NEW YORK, Complainant-,
vs.
THE STATE OF NEW JERSEY et al.

The motion for leave to the United States to intervene herein was submitted to the consideration of the Court by Mr. Attorney General Bonaparte and Mr. Hugh Gordon Miller in support of the same, with leave to Mr. Robert H. McCarter, of counsel for the defendants, to file objections thereto within one week.

January 4, 1909.

Which said motion is in the words and figures following viz:

42 In the Supreme Court of the United States, October Term, 1908.

No. 9, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
v.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Motion on Behalf of the United States for Leave to Intervene.

The Attorney-General of the United States, on behalf of the United States, moves the court for leave to intervene in the above-entitled cause, and for such purpose to file therein its petition, a copy of which is attached hereto, marked "A."

As cause for this motion it is shown:

1. The navigable capacity and future improvement and preservation of one of the principal navigable waters of the United States, to wit, the uppper and lower bays and harbor of the port of New York, are threatened, as disclosed in the subject-matter therein set forth.

2. Commerce between the various States of the Union and
43 between the United States and foreign countries at the port of New York is threatened, as set forth in said petition.

3. A very large amount of property belonging to the United States will be affected injuriously, as therein set forth, and consequently affected by the decision of this court therein.

4. Quarantine regulation, sanitation, and the public health, as relating to commerce at the port of New York in connection with the navigable waters of the United States, are involved in said suit.

5. The questions presented in said suit are of such a character that their determination will vitally affect the interests of the United States and the general welfare.

CHARLES J. BONAPARTE,
Attorney-General.

HUGH GORDON MILLER,
Special Assistant to the Attorney-General.

44 Copy of the enclosed motion served on me December 28, 1908.

EDMUND WILSON,
Attorney-General of the State of New Jersey.

Copy of enclosed motion served on me December 28, 1908.

JOSEPH COULT,
Of Counsel With Passaic Valley Sewerage Commissioners.

Service of a copy admitted December 28, 1908.

MAURICE B. DEAN,
Counsel for Complainants.

45 In the Supreme Court of the United States, October Term, 1908.

No. 9. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
v.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Notice on Behalf of the United States for Leave to Intervene.

To the People of the State of New York, complainants in the above-entitled suit, and to the State of New Jersey and Passaic Valley Sewerage Commissioners, defendants therein:

You, and each of you, are hereby notified that on Monday, January 4, 1909, the Attorney-General of the United States will move the above court on behalf of the United States for leave to intervene in the above-entitled suit, and for said purpose to file its petition therein. A copy of said proposed motion and petition are herewith attached.

CHARLES J. BONAPARTE,
Attorney-General.

HUGH GORDON MILLER,
Special Assistant to the Attorney-General.

46 Copy of the enclosed notice served on me December 28, 1908.

EDMUND WILSON,
Attorney General of the State of New Jersey.

Copy of the said notice served on me December 28, 1908.

JOSEPH COULT,
Of Counsel With Passaic Valley Sewerage Commissioners.

Service of a copy admitted December 28, 1908.

MAURICE B. DEAN,
Counsel for Complainants.

47 In the Supreme Court of the United States, October Term, 1908.

No. 9. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
v.
THE STATE OF NEW JERSEY et al.

Motion on Behalf of the United States for Leave to Intervene and Notice of Submission of Same.

Filed Jan'y 4, 1909.

48 And on the same day, towit, the 4th day of January, A. D. 1909, the following order for appearance was filed, viz:

Order for Appearance.

Supreme Court of the United States, October Term, 1908.

No. 9. Orig'l.

THE PEOPLE OF THE STATE OF NEW YORK, Compl't-,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEW-AGE COMMISSIONERS.

The Clerk will enter my appearance as Counsel for the defendant the Passaic Valley Sew-age Com'rs.

(Name:) CHANDLER W. RIKER,
(P. O. Address:) *Lawyers' Bldg., Newark, N. J.*

NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

Endorsed: Supreme Court U. S. October Term 1908. Term No. 9 Orig'l. Appearance for Def't, the Passaic Valley Sew-age Com'rs. Filed Jan. 4, 1909.

49 And on the same day, towit, the 4th day of January, A. D. 1909, the following entry appears of record, viz:

9. Original.

PEOPLE OF THE STATE OF NEW YORK, Complainant-,
vs.
THE STATE OF NEW JERSEY et al.

On motion of Mr. Robert H. McCarter, of counsel for the defendants, leave is hereby granted to file the answer of the defendants herein.

January 4, 1909.

Which said Answer is in words and figures following, viz:

In the Supreme Court of the United States, October Term, 1908.

No. 9. Original.

Between

THE PEOPLE OF THE STATE OF NEW YORK, Complainant-,
and
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS OF THE STATE OF NEW JERSEY, Defendants.

Answer.

The Joint and Several Answer of the State of New Jersey and Passaic Valley Sewerage Commissioners, Defendants, to the Bill of Complaint of The People of the State of New York, Complainant-.

The defendants, for answer to the bill of complaint filed herein and to so much and such parts thereof as they are advised it is material for them to make answer unto, answering say:

1. They admit that the State of New York and the State of New Jersey are States of the Union, the United States of America, and that the defendant, Passaic Valley Sewerage Commissioners, is a body politic and corporate, existing under the laws of the State of New Jersey, and is a citizen of the said State.

2. They admit that the boundary line between the State of New York and the State of New Jersey, from a point in the middle of Hudson River, opposite the point on the west shore thereof, in the 41st degree of North latitude to the main sea, is the middle of the said river, of the bay of New York, of the water between Staten Island and New Jersey and of Raritan Bay, to the main sea and that this boundary line was established and defined in a com-
51 pact or agreement made, ratified, and approved, as in the said bill stated, and that a true copy of the said compact or agreement is annexed to the said bill of complaint and marked Schedule A; and these defendants admit that the State of New York has and exercises jurisdiction over Bedloes Island and over islands on the east or New York side of the said boundary line, but these defendants are informed and believe and therefore charge the truth to be, that Ellis Island is the property of the United States, and that the Government of the United States has and exercises exclusive jurisdiction over the said island; and these defendants deny that the complainant, the State of New York, has and exercises exclusive jurisdiction over the waters of the Bay of New York and of the Hudson River lying west of Manhattan Island and to the south of the mouth of Spuyten Duyvil Creek, and of and over the lands covered by the said waters to the low water mark on the westerly or New Jersey side thereof, and these defendants admit

that the complainant, in virtue of the provisions of the compact before referred to, has a certain police control over the said waters, for the enforcement of proper quarantine regulations, and they charge that the power of the complainant over such waters is limited and confined thereto, and that such control over the said waters is not property right, or a control or right to be exercised or held adversely to the State of New Jersey by the complainant, the State of New York, but for the equal benefit and protection of the interests of both governments and the people of both states, and these defendants charge and show that so far as the commerce and navigation are concerned, the State of New York, the complainant, has no power of regulation or control over the said waters, but that such regulation and control is vested in the Government of the United States, and that, subject to such control of the Government of the United States, the State of New Jersey may use and occupy the said lands and waters by constructing thereon and therein wharves,
piers, docks, and other constructions, and by such filling in and
52 constructions exclude therefrom any of the waters of the said
bay, and they charge and insist that the defendant, the State of New Jersey, subject to the control of the legislative department of the Government of the United States for the protection of commerce and navigation, has the right and power directly and by its duly appointed and authorized agents to construct and use sewers and conduits placed within the territory of the said State under or through the waters of the said bay.

3. And these defendants admit and show that so much of that part of the Bay of New York, which is commonly called the Upper Bay, as belongs to the State of New York, is bounded by the said city of New York on the north, east, and south, and that so much of said Upper Bay as belongs to the State of New Jersey is bounded on the west by the cities of Bayonne and Jersey City, municipalities of the State of New Jersey; and these defendants further show and insist that the said bay is divided by the boundary line between the State of New York and the State of New Jersey as fixed and established by the compact and agreement between the said State above referred to, and that the said dividing line is the middle of the said waters between the said States; they admit and show that the East River flows into the Upper Bay within the State of New York, and that the Hudson River flows into the said Upper Bay, partly within the City of New York and State of New York and partly within the City of Jersey City in the State of New Jersey, and they show that they are not informed with respect to the length of the shore line of the State of New York on that part of New York Bay called the Upper Bay, and leave the Complainant to make such proof concerning the same as it may be advised is material and necessary.

They further admit that the water front of the City of New York
bordering on the Hudson River and on the East River and
53 upon the New York Bay is improved with wharves, piers,
and docks, which are used for the purposes of commerce,

and some of them also, as well as some of the natural shores of the Bay within the said City, are used in part for the health and pleasure of the inhabitants; and these defendants charge and show that the water front of the Cities of Hoboken, Jersey City, and Bayonne and the water front of the other municipalities of the State of New Jersey, many miles in extent, situate and lying upon the western shore of the said Bay and the Hudson River, is also improved with wharves, piers and docks, used for the purposes of commerce, and some of them also, as well as the natural shores of the Bay within said municipalities of the State of New Jersey, are used in part for the health and pleasure of the inhabitants.

4. These defendants, further answering, say that they have no definite information as to the population of the City of New York, the value of the real property therein, the assessed value of the personal property of the inhabitants of the said City, or of the actual value of such personal property, including that which is not taxed, and they leave the Complainant to make such proof thereof as it may be advised is proper and necessary.

5. These defendants, further answering, admit and show that north of the 41st degree of North latitude the Hudson River lies wholly within the State of New York; that the tide ebbs and flows in it and that it is navigable as far as Albany, one hundred and fifty miles, or thereabouts, north of the Bay of New York; that the said river is navigated by a large number of vessels, some of which are employed in commerce with other states of the Union, and with other countries; and they charge and show that the State of New Jersey lies in part along the westerly side of the Bay of New York, having a shore li-e upon the said bay of about seven miles in extent, and they show that the vessels navigating the Hudson River and the New York Bay are, many of them, owned and
54 controlled by the inhabitants of the State of New York, and many of them are owned and controlled by the inhabitants of the State of New Jersey, and that many of them sail from docks lying within the State of New York and many of them also sail from docks lying within the State of New Jersey; and they further show that the State of New Jersey has a shore line on the Bay of New York and on the Hudson Ri*b*er of about twenty-five miles in extent.

6. These defendants, further answering, admit and show that a law was passed by the Legislature of the State of New Jersey, entitled "An Act to create a sewerage district to be called The Passaic Valley Sewerage District," and that this act constitutes Chapter 48 of the Laws of the State of New Jersey and was approved March twenty-seventh, nineteen hundred and two, and they also admit that the Legislature of the State of New Jersey in the year nineteen hundred and seven enacted a law, entitled "An Act to provide for the purification of the Passaic River within the Passaic Valley Sewerage District, prohibiting the discharge of sewage and other polluting matter into the said portion of the said river after a fixed date, and authorizing municipalities lying in whole or in part within the Passaic Valley Sewerage District, from the territory of which

sewage or other polluting matter is or may be discharged into the said portion of the said river, to enter into contracts with each other and with the Passaic Valley Sewerage Commissioners for the intercepting and disposal of such sewage and other polluting matter, and to provide the necessary funds therefor," and that the last mentioned act constitutes Chapter 10 of the Session Laws of the State of New Jersey for the year nineteen hundred and seven, and that said act was approved on the eighteenth day of March, nineteen hundred and seven; and they admit that copies of the said acts of the Legislature of the State of New Jersey are annexed to the said bill of complaint and are marked Schedules B and C
55 respectively; and they further admit that the occasion for the enactment of the said laws was that the Passaic River had become so corrupt and polluted by the sewage which empties into in from the natural drainage area of the said river, as to be offensive and injurious to health and to the comfort of the inhabitants of the adjoining territory.

7. And these defendants, further answering, show that the Passaic River is a stream of water which rises in the northern part of the State of New Jersey and runs in a southeasterly direction through the counties of Passaic, Bergen, Hudson and Essex and discharges its waters into the Newark Bay in the said State of New Jersey and that this river for a long time past has become so polluted by the discharge therein of sewage and other polluting matter from the towns, cities, and municipalities through which the said stream flows, between the Great Falls of the said river in the City of Paterson and the mouth of the said river at Newark Bay (as well as the persons and corporations residing and located in the said district) that an intolerable nuisance has been thereby created which greatly depreciates the value of property, located on or near the said river, and renders the occupation and use of the same difficult and dangerous; that the Passaic River is navigable as far as the City of Passaic and the tide ebbs and flows in the river to the Dundee Dam, six miles below the City of Paterson.

8. And these defendants further show that this defendant, the Passaic Valley Sewerage Commissioners, in pursuance of the power and authority thus conferred upon it did prepare maps, plans and specifications for the construction of a trunk or intercepting sewer or conduit with lateral sewers or conduits for the purpose of taking up and making disposition of the sewage and other polluting matter discharged into the waters of the said river and the streams tributary thereto from the municipalities situate in whole or in
56 part within the said sewerage district, together with estimates of the cost of such construction and of the cost of maintenance and operation thereof, and has submitted such plans and estimates to the governing body of each of the said municipalities as in the said act directed.

9. And these defendants, further answering, say that while several of the said municipalities have indicated by the action of their governing bodies that they consider it expedient and to the interests of their several municipalities to enter into a contract with

this defendant, the Passaic Valley Sewerage Commissioners, for the construction and operation of a joint intercepting sewer or sewers in the manner and according to the plans proposed by it, that in fact no such contract has yet been entered into, but this defendant, the Passaic Valley Sewerage Commissioners, admits that, in pursuance of the power and authority so conferred upon it, it is willing to and intends to enter into a contract with the said municipalities, or one or more of them, for the execution of the plans and works so prepared and designed by the said commissioners.

10. And these defendants, further answering, admit and show that they have given the notice required by the last mentioned act, to each of the said municipalities and the inhabitants thereof, that the discharge of sewage and other polluting matter into the waters of the said river at any point between the said falls and the mouth of the said river at the Newark Bay must be discontinued on or before the twelfth day of December in the year nineteen hundred and twelve.

11. And these defendants, further answering, admit and show that the plans so adopted by them and so submitted by them to the said municipalities for the relief of the said river and for the disposal of the polluting matter now discharged into the waters of the said river, provide for the construction of a main inter-
57 cepting sewer or sewers extending from the Great Falls of the said river in the City of Paterson, following generally the course of the said river to the City of Newark, and from thence across the Newark Meadows to the Newark Bay, and from thence by a tunnel to be constructed under the waters of the said bay and the lands covered by its waters and under the Cities of Bayonne and Jersey City and through the soil underlying the waters of the Bay of New York, to a point in the said bay about five hundred feet north of Robbins Reef Light on the westerly side of the main ship channel in the said bay and of the line so established, as aforesaid, dividing the territory of the two states within the said Bay of New York, and about one quarter of one mile westerly from the said line.

They further show that the plans so prepared provide for intercepting and taking into the main and lateral sewers so to be constructed all the sewage and other polluting matter (including therein, however, only ten per cent. of the factory waste) which now is or hereafter otherwise would be discharged into the waters of the said river or into the streams tributary thereto within the said sewerage district, and that the capacity of the conduits and construction so provided will be sufficient to take up and dispose of the said sewage and other polluting matter, including the ten per cent. of the factory waste, for the present and for a reasonable time in the future, and, as these defendants estimate, for a period of not less than thirty years.

And these defendants admit that, in fixing and determining the capacity of the construction so proposed, they have estimated that the population of the said district for the year nineteen hundred and five was 601,817 persons, that the population for the year nine-

teen hundred and eleven will be 702,400 persons and that in the year nineteen hundred and forty, the population within the said district will increase to 1,649,440 persons, and they charge
58 and show that while the entire capacity provided therein both for the present and future is a maximum capacity for the receipt of 357,365,220 gallons daily, the daily average flow in nineteen hundred and forty will not exceed 250,000,000 gallons.

12. And these defendants, further answering, show that the plans so prepared provide for a pumping station to be located near the Newark Bay on the Newark Meadows, to which point the sewage and other matter received within the said sewers and conduits will flow therein by gravity; and for the purpose of obtaining a sufficient height and pressure to discharge the matter passing from thence into and through the said tunnel to the place or point of discharge; and that, at such pumping station, all matter passing into and through the said tunnel will first be passed through a grit chamber, in order to remove the gravel and all other heavy material, and through a screen chamber, in order to remove all floating matter; and that it is intended, after such treatment, to discharge the effluent at the point above stated, into the deep waters of New York Bay, within the territory of the State of New Jersey, and where there is ample volume of water to thoroughly assimilate and diffuse it without causing serious or offensive pollution and without increasing the present pollution of the Bay of New York; and they show and charge that such discharge is not intended to be made through a circular opening twelve feet in diameter, as was charged in the said bill, but that the contents of the said conduit will, at the point of discharge, pass through a number of pipes, each of sufficient capacity to vent its quota of the effluent thus discharged, and that these small discharge pipes will be extended in different directions and in varying lengths in the main channel, and will be provided with discharge openings venting the contents of the said sewer in small units horizontally in the direction of the tidal currents of the said bay and over a sufficient area and
59 by such number of vents as will provide a rapid assimilation of the discharge with a very large volume of the waters of the said bay, and that the discharge so to be made in the waters of the said bay will be made at a depth of not less than forty feet below the surface of mean high water in the said bay.

13. These defendants, further answering, say that for more than ten years past the question how and in what manner the people residing in the said sewerage district and the property located therein could be relieved from the nuisance so created, and the question as to what disposition should be made of the polluting matter which would otherwise be discharged therein, have received the attention not only of the people residing in and owning property in the said district, but of the legislative and executive departments of the state government of the State of New Jersey; and that the said act of March eighteen, nineteen hundred and seven, above referred to, authorizes this defendant, the Passaic Valley Sewerage Commissioners, at the request of the municipalities, as

above stated, to prepare the plans and make the estimates for the construction and operation of a joint intercepting sewer or sewers to intercept and take up the polluting matter and conduct it to some safe and proper place of discharge and disposal; and these defendants further say that the question as to where and under what conditions the polluting matter so to be intercepted and taken up by and through the sewers so to be constructed could safely be discharged and disposed of without thereby creating a public or private nuisance, was also fully and carefully examined by these defendants.

They further charge and show that the disposal works of nearly all the large cities of this country and of foreign countries were visited and examined by the said commissioners, and by persons selected by them for that purpose, before determining upon the place of deposit and disposal; and that the plans adopted
60 by the said commissioners were prepared by and were recommended and approved by sanitary engineers of the highest professional standing and ability; that the said plans were first prepared by Rudolph Hering, a civil engineer of large experience, who supervised the plans for the construction of the Chicago drainage canal and other constructions of a like character; that before the said plans prepared by him were adopted by this defendant, the Passaic Valley Sewerage Commissioners, the said commissioners were required by an act of the Legislature of the State of New Jersey, approved April twenty-second, nineteen hundred and three, before making an expenditure of money or incurring any obligation for the construction of any trunk or outlet sewer which would discharge into the waters of New York Bay, to carefully investigate whether such disposition was likely to pollute the waters of the said bay within the jurisdiction of the State of New York to such an extent or to such a degree as to cause a nuisance, to persons or property within the said state, and to report the result of such investigation to the Governor of the State of New Jersey, with their opinion thereon, and their reasons for such opinion; and this defendant, the Passaic Valley Sewerage Commissioners, did thereupon proceed at once to make the investigation so directed and did on the eighth day of June, nineteen hundred and three, report the result of its investigation to the Honorable Franklin Murphy, then Governor of the State of New Jersey, and that the report of said commissioners so made shows that they did report that the proposed discharge into the waters of the Bay of New York within the State of New Jersey was not likely to pollute the waters of the said bay, to such an extent or to such a degree as to cause a nuisance to persons or property within the said State of New York, and said report stated the reasons for such opinion, and did further show that in reaching the conclusion thus arrived at the said commissioners obtained the opinion upon this question of engineers and experts of the highest professional character and of the
61 greatest professional reputation, who had made a study of the conditions existing in the Bay of New York, its tidal flow and currents, as well as the conditions existing in adjacent

waters, and that a true copy of the said report with the opinion so obtained is hereto appended and marked Schedule 1.

14. And these defendants, further answering, show that all or nearly all of the sewage or other polluting matter which is discharged into the Passaic River, directly or indirectly, below the Great Falls in the City of Paterson now passes down through the said river and thence into the Newark Bay and finally reaches and is discharged into the waters of the Bay of New York at or near Robbins Reef Light without any appreciable injury to such waters, and without causing any nuisance, and they further show that the reason why the sewage and polluting matter causes a nuisance to persons and property in its passage down the said river before it is discharged into the Newark Bay is because of the peculiar character of the flow in the said river and the peculiar formation of the said bay; that there is, during periods of dry weather and seasons of least flow, a very small quantity of fresh water flowing down the said river at the point where the tidal current in the said river meets and overcomes the fresh water flow, and that at such times and seasons the tidal flow meets and overcomes the said fresh water flow at or near the City of Passaic, which city is, following the course of the said river, about nine miles distant from the Great Falls in the City of Paterson, and about fourteen miles distant from the mouth of the said river at Newark Bay; and that the sewage and polluting matter discharged into the said river from the Cities of Paterson and Passaic, both large manufacturing cities, is so great that in such seasons where the fresh water flow meets and is overcome by the tidal flow the waters of the said river are overburdened with said
62 polluting matter; and that the water of the said river at this point at such seasons becomes noxious and offensive; and that from this point down to the mouth of the said river at Newark Bay this polluting matter, largely increased by the discharge of sewage from the towns, villages and cities below, is carried slowly backward and forward by the action of the tides and does not reach the said bay until about ten days after it has started on its passage down the said river from the said point, and that as a consequence the waters of the said river are overburdened with offensive matter which neither the fresh water flow nor the tidal flow in the said river can effectively dilute or dissipate.

15. And these defendants, further answering, show that the waters of the said Newark Bay, which cover a considerable area of land, are shallow and do not rapidly take up and assimilate the sewage discharged therein.

16. And these defendants, further answering, show that above the Great Falls in the City of Paterson the Passaic River is comparatively a pure water stream; that its waters above the said falls *and* used for potable purposes; and that the pollution of these waters to any considerable extent commences below the said falls, and is caused by the discharge therein of sewage, factory waste, and other polluting matter; and they charge and show that, if this polluting matter so discharged therein, is taken up and conducted through the trunk sewer or sewers so to be constructed as above set forth,

the nuisance now existing in the said river will be abated, and that no injury will be thereby inflicted upon persons or property within or without the State of New York.

17. And these defendants, further answering, say that the waters of the Bay of New York are capable of dissipating and harmlessly disposing of the sewage and waste of a population many times greater than that of all the municipalities which are now discharg-
63 ing sewage and waste directly or indirectly into the waters of the said bay, including therein all sewage and factory waste discharged through Newark Bay and the Kill von Kull, and are sufficient, as they are informed and believe and charge the truth to be, to dissipate and harmlessly dispose of all the sewage and waste of a population of at least 25,000,000 of people.

18. And these defendants, further answering show and charge that, by the authority and with the consent of the complainant herein, the cities and municipalities of the said State of New York, located on or near the Bay of New York and on or near the Hudson River and East River within the said state, including the cities of New York and Brooklyn, are now, and for a long time past have been, discharging sewage, factory waste, and other polluting matter directly into the waters of the said bay and into the rivers and streams tributary thereto, and that sewers, drains, and conduits have been constructed by the said municipalities for conducting the said sewage, factory waste, and polluting matter into the waters of the said bay and river, and that the said sewage, factory waste, and other polluting matter so conducted and discharged into the said waters does not in any respect differ in character from that discharged into the waters of the Passaic River within the said sewerage district, and that the volume and *and* amount of the said matter so discharged by the said cities and municipalities of the State of New York exceeds the amount discharged into the waters of the Passaic River by as much as the population of the municipalities of the State of New York discharging such matter into the water of the said bay exceeds the population of the municipalities of the State of New Jersey situate within the said sewerage district, which is in about the proportion of seven and one half to one; and these defendants show and charge that the State of New York has recently, by legislative enactment, authorized the construction of a large sewer through the Borough of Bronx in the City of New York, which borough lies to the north of the
64 Borough of Manhattan and has a frontage on New York Bay, into which sewer is to be received the sewage from the said Borough of Bronx and from other towns and villages in the vicinity, and through which is to be carried crude sewage in large volume and from thence discharge into the New York Bay or at near the exterior pier line, and that such sewer has within the last few months been in fact constructed and is now emptying the said crude sewage as authorized by the legislature of the State of New York; and these defendants show that if there should be any injury to persons or property by reason of the discharge of sewage or factory waste into the waters of the Bay of New York to the people

of the State of New York, such injury would be caused largely, if not entirely, by the discharge so made by the municipalities of the State of New York, and they further show that such injury would not arise from the disposal of sewage in the manner and according to the plans adopted by the commissioners for the relief of the persons and property within the said sewerage district; they further show that if any injury should occur from the discharge of sewage into the waters of the Bay of New York it would be because the sewage, factory waste, and polluting matter discharged by the municipalities of the State of New York into the waters of the said bay is discharged therein in its crude state, without screening or other treatment, and at or near the surface of the waters of the said bay; and they further show that if such sewage discharged from the municipalities of the State of New York was treated by and in the manner proposed in the plans adopted by the defendant commissioners for the treatment of the sewage to be discharged from the said district and was discharged into the deep waters of the said bay, no harmful effect would arise therefrom to persons or prop-
65 erty within the State of New York, or persons or property within the State of New Jersey.

19. And these defendants, further answering, submit that while the municipalities of the State of New York, with the permission of the complainant, are discharging vast quantities of crude sewage, factory waste, and polluting matter directly into the waters of the Bay of New York, without screening and without sedimentation, they should not be heard to complain that the State of New Jersey proposes to discharge sewage in much smaller quantity, treated as before set forth, into the waters of the said bay within the State of New Jersey.

20. And these defendants, further answering, show that the lands under the waters of the Bay of New York under and through which, according to the plans so prepared by the said commissioners, the sewer and conduit to be constructed by them will be laid, and the point and place of disposal as therein indicated and shown, are within the territory of the defendant, the State of New Jersey, and under its jurisdiction and control, and that this defendant, the State of New Jersey, had and has legal right and authority to authorize and empower the defendant, The Passaic Valley Sewerage Commissioners, to make, construct, and use for the purposes indicated the works and constructions as proposed, and has lawfully conferred upon the defendant commissioners such power and authority.

21. And these defendants, further answering, say that sewers constructed by the cities of New York and Brooklyn discharging sewage and factory waste into the Bay of New York have been constructed and in use in the said cities for more than two hundred years last past, and that like constructions have been made and used for the same purpose by the cities of Jersey City and
66 Hoboken, discharging sewage and factory waste into the said waters, for more than seventy years last past, and they charge and insist that the municipalities located upon the Passaic River, a tidal river discharging into the Newark Bay, have equal

right with the municipalities of the State of New York to use the waters of Newark Bay and New York Bay in order to dissipate and discharge sewage and factory waste, and they charge and show that the waters of the Bay of New York and the waters of the Newark Bay mingle and together form one bay or harbor.

22. And these defendants, further answering, show that since the line separating the State of New York from the State of New Jersey was defined by the commissioners appointed by the said states, the lands under water on the New Jersey side of the said line have been for all purposes, subject to the control of the Government of the United States for purposes of commerce and navigation, in the exclusive possession of the State of New Jersey, and such lands by the consent of the United States Government have been granted to persons and corporations by and under the authority of the State of New Jersey; that such lands have been filled in and occupied and used by the grantors, their successors and assigns, without objection or interruption for a long time past; that the Government of the United States has from time to time indicated and established a line in the Bay of New York between the original line of low water mark on the New Jersey shore and the easterly line between the said states, as so fixed and determined, to which solid filling may be extended; and that such solid filling has in some instances extended easterly from the original line of low water mark on the New Jersey shore in the waters of the said bay for a distance of more than one mile.

67 23. These defendants, further answering, show that the State of New Jersey is the owner of and has title to the lands under waters of the Bay of New York west of the boundary line between the said State of New York and the State of New Jersey, and that its title thereto is recognized and admitted by the Government of the United States in and by the grant and conveyance made by the State of New Jersey to the Government of the United States at its request of lands covered by the waters of the said bay adjacent to Ellis Island, and in and by the grant of the said state to the Government of the United States for a light house reservation at Robbins Reef, a copy of each of which said conveyances is hereto appended and marked Schedules 2 and 3, and these defendants pray that the same may be deemed and taken as a part of this their answer to the said bill of complaint.

24. And these defendants, further answering, deny that the sewage so to be deposited within the water of the Bay of New York by the constructions proposed to be made by the said commissioners will be borne by the currents and tides throughout the bay and into the channel of the Hudson and East Rivers, and will be deposited on the bottom and on the shores and about the wharves and docks of the City of New York, or that it will pollute the said waters and shores, wharves, and docks.

25. And these defendants further admit and show that fourteen of the twenty municipalities within the said natural drainage area of the Passaic River have consented to and approved of the plans prepared by the said commissioners, and have signified their will-

ingness to adopt and use the said proposed sewer for the disposal of the sewage of their respective localities; and they deny that the amount of sewage that these municipalities will furnish at the outset will in the aggregate amount to 120,000,000 gallons in twenty-four hours; and they charge and show that the average amount of sewage furnished from the said localities will not exceed 60,000,-
000 gallons each twenty-four hours, and that the said de-
68 fendant commissioners in the plans prepared by them propose to discharge the same into the waters of the Bay of New York through the outlets of the said sewer over lands belonging to the State of New Jersey; they admit that other municipalities within the said drainage district propose to adopt and use the said proposed sewer, and that these defendants intend to receive their sewage therein and dispose of the same into the said waters of New York Bay; that the matter intended to be received and discharged through the said sewer will contain not only the sewage of the individual inhabitants of the said municipalities but ten per cent. of the factory waste discharged from a number of manufacturing plants of divers kinds; and they deny that it will be discharged undefecated and that it will be at the point of discharge disagreeable and offensive to the senses, and they deny that it is or will be poisonous or otherwise injurious to human beings and other animal organisms or to fish and oysters, or that it is or will be injurious by chemical or other action to wood and metal.

26. And these defendants, further answering, say that they have no knowledge that the waters of the Bay of New York are largely used for bathing by the inhabitants of the State of New York and particularly of the City of New York, or that the City of New York supports free bath houses, or how many baths were taken in the waters of the New York Bay and in the Hudson and East Rivers adjoining the bay in the summer of the year nineteen hundred and seven, and they leave the complainant to make such proof thereof as it may be advised is necessary, and they deny that the intended acts of these defendants, if carried out, will render the waters of the New York Bay unwholesome or offensive or unsuitable for bathing, and these defendants charge and show that the bathing in the waters of the Bay of New York by the inhabitants of the State of New York and of the State of New Jersey would be rendered very much more pleasant and agreeable if the
69. free bath houses supported by the City of New York were not located at or near the point of discharge of the crude sewage of the city into the Bay of New York; and they show that the free bath houses of the City of New York are located along the shores of the said bay and of the Hudson River and East River and near the waters of the said bay into which the sewage of the said cities is discharged in its crude state and near the point of such discharge.

27. And these defendants, further answering say that they have no definite knowledge of what the commerce of the Port of New York consists, or of the number of passengers, or the quantity of merchandise carried upon ocean going or other ships engaged in

international or coastwise trade or on the ferry boats or other vessels plying on the waters of the said bay and of the Hudson River and East River, or whether all of trans-Atlantic lines, or what particular or other steam or ocean going vessels of any description enter or leave the Port of New York, traversing the Bay of New York, or that for the year ending June 30, 1907, the aggregate value of the imports at the Port of New York was upwards of $853,000,000, or that the exports were upwards of -627,000,000, or what proportion this may be of the commerce of the whole country, or in what manner it may have contributed to the national revenue and to the trade and prosperity of the State of New York or of the United States, or what part of the wealth and prosperity of the inhabitants of the State of New York have resulted from the commerce of that port, or that one of the most efficient causes that has obtained for the City of New York such alleged commerce, or that one of the most essential elements in retaining it in the future is the Bay of New York or that anything that tends to make the Bay of New York less serviceable or attractive for commerce, would tend also to diminish the welfare of said city and also of the state, and also injure the whole country, but leave the complainant to make such proof of such several matters as it may be advised
70 is material or necessary.

And these defendants deny that the intended acts of the defendants set forth in the complainant's bill of complain*ant* will, if not restrained, tend to make the Bay of New York less serviceable or less attractive to commerce, and deny that the discharge of sewage in the manner aforesaid into the waters of the said bay will render them offensive or that there will be any unwholesome emanations therefrom, or cause such waters, shores, and docks to appear unsightly, or will cause injurious action upon the hulls of vessels or upon wharves, docks, or other structures, or will become a source of danger or disease, or other dangers to which travelers might be exposed, and deny that it will cause the pollution of such waters.

28. And these defendants charge and show that the defendant The Passaic Valley Sewerage Commissioners, has not now and never has had any intention to proceed in the execution of any contract with the municipalities within the said sewerage district or any of them for the construction of the works designed by the said commissioners for the said municipalities and the inhabitants thereof, as hereinbefore described and set forth, without first obtaining the consent of the Government of the United States to make the constructions proposed in and under the waters of Newark Bay and in and under the waters of the Bay of New York, and they charge the truth to be that when they ascertained and were assured that several of the said municipalities were willing to enter into and make such a contract with this defendant, The Passaic Valley Sewerage Commissioners, the said commissioners at once, and before proceeding further, made an application to the Honorable Luke E. Wright, the Secretary of War of the United States, for permission to make the constructions proposed in, under, and through the

waters of Newark Bay and in, under, and through the waters of the Bay of New York, and that said application so made was in form and effect as follows:

71 To the Honorable Luke E. Wright, Secretary of War of the United States of America:

Respectfully represents the Passaic Valley Sewerage Commissioners acting under authority of Chapter 10 of the Laws of 1907 of the State of New Jersey entitled:

"An act to provide for the purification of the waters of the Passaic River within the Passaic Valley Sewerage District prohibiting the discharge of sewage or other polluting matter into said portion of said river after a fixed date, and authorizing municipalities lying in whole or in part within the Passaic Valley Sewerage District, from the territory of which sewage or other polluting matter is or may be discharged into said portion of said river, to enter into contracts with each other and with the Passaic Valley Sewerage Commissioners for the interceptiong and disposal of such sewage and other polluting matter, and to provide the necessary funds therefor." Propose to intercept the sewage from the district now discharging into the Passaic River below the Great Falls at Paterson, and the tributary district which may hereafter discharge into said river, and by the course of said river and Newark Bay and Kill von Kull now reaches the Bay of New York; and convey said sewage by means of a trunk outlet sewer extending from Paterson to a point of discharge in the waters of New York Bay East of Robins Reef at a depth of not less than 40 ft. below mean high water in said Bay.

The proposed alignment and grade of said outlet sewer, from the Westerly side of Newark Bay to the outfall into New York Bay, are as shown on the map and profile attached, and may be further described as follows:

The sewer will be in tunnel from a point West of the Western shore-line of Newark Bay, passing under Newark Bay, the upland of Bergen Neck, and under New York Bay on a line passing as near as may be practicable to the Light House on Robins Reef,

72 to a point where the tunnel intersects the rock contour of the bottom of New York Bay.

At no point in the line beneath the navigable waters of the United States and outside of the established line for solid filling, will any part of such permanent structure, when completed, be less than 35 ft. below mean high water except upon the reef of rock North of and not more than 500 ft. from Robins Reef Light house where it is proposed to place a permanent shaft and shaft house, rising to a height not more than 20 ft. above mean high water.

The point designated for said permanent shaft on Robins Reef will be preferable where the rock approaches nearest to the surface, and consequently beyond the limits of safe navigation.

The tunnel will have an inside diameter of 12 ft. At the Eastern end, where the rock contour is intersected, four or more pipes of cast iron or reinforced concrete of diameters varying from 6 to

2 ft. will be laid in trenches on the bottom of the Bay to such distances (within the limits of the State of New Jersey) in any direction as may be deemed necessary to procure a quick and free dispersion and mixture of the sewage with a large volume of Bay water.

The pipes will be provided with proper openings along their length so that the total volume of sewage discharged may be broken up in units of volume so small as to be quickly dispersed and diluted with a large volume of Bay water.

No discharge opening will be less than 40 ft. below mean high water.

The discharge of sewage through said sewer at present will be from a population of about 600,000 people or practically 10% of the total discharge of sewage into the Bay of New York from the surrounding communities, including the territory to be served
73 by the proposed sewer. The ultimate capacity of the sewer is computed to be for a population of 1,650,000 estimated to be reached in 1940, and it is contemplated will not at that time exceed the present proportion of 10% of the total sewerage tributary to New York Bay. It is proposed to subject the sewage to a process of thorough screening to remove matter carried in suspension, and also to provide for the sedimentation and removal of sand and grit, at the pumping station in the Newark Meadows, before allowing the sewage to enter the outfall tunnel.

The undersigned Commissioners respectfully request that the following works may be authorized, approved and permitted so far as they come within the jurisdiction and supervision of the War Department:

First. The construction and permanent maintenance of tunnels under navigable waters of Newark Bay and New York Bay, as shown by the plans attached.

Second. The construction, laying and permanent maintenance of four or more outlet pipes of a diameter varying from 6 ft. to 2 ft. in trenches beneath the navigable waters of New York Bay within the territory of the State of New Jersey, and not less than 40 ft. below mean high water, as shown by the plans attached.

Third. Construction and permanent maintenance of a shaft, and shaft-house upon the rock of Robins Reef not exceeding 100 ft. square, and not exceeding 20 ft. in height above high water. The sit of said shaft to be determined so as not to interfere with navigation and not to be inconsistent with the proper uses of Robins Reef for lighthouse purposes.

Fourth. The temporary erection and use, during construction of such cribs as may be required for construction shafts in the navigable waters of Newark Bay and New York Bay West of Robins Reef and outside the established lines for solid filling. The
74 said construction to be located, built and maintained to the satisfaction of the United States authorities having supervision of said waters, and to be removed on the completion of construction.

Fifth. Permission to erect and maintain such temporary plat-

forms, floats or other structures within navigable waters as may be required for the purpose of sounding and boring to determine the character of the bottom. The said structures to be located, built and maintained to the satisfaction of the United States authorities having supervision of said waters.

All work, in or below navigable waters, both permanent and temporary, to be subject to the approval and supervision of the United States authority having jurisdiction over the said waters.

PASSAIC VALLEY SEWERAGE COMMISSIONERS.

(Signed.) J. A. LEBKUECHER.
FRANCIS CHILD.
W. S. ACKERMAN.

Attest:
JOHN S. GIBSON, *Clerk.*

Dated, Newark, N. J., September 23, 1908.

And these defendants also show that there was presented to the said department with the said application, and as part thereof, a diagram or plan showing the alignment, grade, and outfall of the sewer proposed to be constructed from the west side of Newark Bay to the outfall in the Bay of New York, and that a copy of the said diagram or plan is hereto annexed, marked Schedule 4, to which they beg leave to refer if it be necessary so to do.

They further show that the said application so made to the Secretary of War was afterwards, and on or about the thirteenth day of October, nineteen hundred and eight, referred by Frederick V. Abbot, Acting Chief Engineer of the said department, to
75 Col. D. W. Lockwood, Corps of Engineers, an officer of the said department, for a report thereon by the New Harbor Line Board, and that the endorsement made on the said application for this purpose is in form and effect as follows:

"War Department, Office of the Chief — Engineers, Washington, October 13, 1908.

"1. Respectfully referred to Col. D. W. Lockwood, Corps of Engineers, for report by the New York Harbor Line Board.

"2. It is the desire of the Chief of Engineers that in considering this subject the Board give consideration not only to the interests of navigation, but also to the interests for whose benefit this work is proposed. In other words, it is desired that the report of the Board cover the entire subject in comprehensive manner.

"3. An expression of opinion is desired as the *the* practicability of requiring the builders of this sewage disposal system to remove by dredging any deposit in navigable waters caused by the projected works.

"FREDERICK V. ABBOT,
Acting Chief of Engineers."

They further show that the said New York Harbor Line Board thereupon gave notice that a public hearing would be given by the said Board to these defendants and others in favor of and against the granting of the permission asked for, at the Army Building, No. 39 Whitehall Street, in the City of New York, at ten o'clock A. M. on Wednesday, the ninth day of December, ninteen hundred and eight, and that the notice so given by the said Board was in form and effect as follows:

"United States Harbor Line Board for Harbor of New York and Adjacent Waters, Army Building, New York City, November 14, 1908.

"1. Under the Laws of the State of New Jersey, the Passaic Valley Sewerage Commission propose to intercept the sewage from the district now discharging into the Passaic River below the
76 Great Falls at Paterson and the tributary district which may hereafter discharge into said river, and convey it beneath the waters of New York and Newark Bays by means of a trunk outlet sewer ending near Robbins Reef in Upper New York Bay.

"2. Application has been made to the Secretary of War by the Passaic Valley Sewerage Commission for the consent of the War Department to the construction and maintenance of such sewer, and the matter has been referred to the U. S. Harbor Line Board for the Harbor of New York and its adjacent waters for a comprehensive report on this entire subject.

"3. The Board will give a Public Hearing on this subject in the Army Building, No. 39 Whitehall Street, New York City at ten A. M. on Wednesday, December 9, 1908, which you are invited to attend.

"Very respectfully,

"D. W. LOCKWOOD,
Colonel, Corps of Engineers, Senior Member of Board."

And these defendants show that the said hearing before the New York Harbor Line Board took place at the time and place mentioned in the said notice, and continued on the following day, and that a number of persons were heard by the said Board for and against the granting of the permission so requested, and that the said hearing was then concluded; and they further show that the matter of their application, so referred to and heard by the New York Harbor Line Board, is still pending and undetermined before the said Board, and that no report thereon has as yet been made by said Board, and that no further action has since been taken thereon by the War Department of the United States, and they charge and insist that the question as to whether the construction so proposed to be made in and under the waters of the Newark Bay and the waters of the Bay of New York, and the use thereof for the purposes and in the manner stated in the said application, will improperly and unlawfully
77 affect or injure commerce or navigation is not at this time a matter within the jurisdiction of this court.

30. And these defendants, further answering, deny that the in-

tended acts of the defendants, when carried out, will injure the health and impair the safety and comfort of the inhabitants of the State of New York, and particularly of the inhabitants of the City of New York and would be injurious to travelers and other persons resorting to the said city and state about their lawful avocations.

31. And these defendants, further answering, say that they have no definite knowledge of the extent or value of the fisheries within the Bay of New York, or what plantations of oysters or clam beds there may be within the said bay, or whether marine fish in great numbers enter the bay from the ocean, or that the fisheries supply food to the City of New York, or give employment to persons. They deny that the proposed discharge of sewage by them in the manner herein set out would *polite* the waters of the bay, or drive away any of the fish, or would poison or render unfit for food any oysters or clams or other fish, or would impair or destroy the value of any fisheries which may be in the said Bay of New York or the waters contiguous and adjacent thereto.

32. And these defendants deny that the acts charged in the complainant's bill of complaint as acts threatened and intended by the defendants, the State of New Jersey and The Passaic Valley Sewerage Commissioners, are either threatened or intended at this time, or are intended to be performed unless and until the works and construction hereinbefore referred to in, under or through the harbor of New York shall have received approval of the Secretary of War of the United States and the construction thereof shall have received the approval of the Chief of Engineers of the War Department of the United States; and they deny that such charged
78 intended acts of the defendants are in contravention of Section 75 of the Public Health Law of the State of New York; and they further deny that Section 75 of the Public Health Law of the State of New York has any application to the waters of the Bay of New York; and especially deny that it has any application to the waters in the Bay of New York lying on the west of the boundary line between the State of New York and the State of New Jersey; and they deny that the complainant, the State of New York, has authority to pass any law, the object of which is to prevent the discharge of sewage from the municipalities of the State of New Jersey into the Bay of New York over or upon lands owned by the State of New Jersey; and they deny that said Public Health Law has any application to the acts of the defendants in the construction and use of sewers or conduits proposed to be constructed by the defendants.

33. And these defendants, further answering, deny that the intended acts of the defendants, if repeated and continued from day to day, in perpetuity, would result in a manifest and irreparable injury of the complainant, or the health, safety, and welfare of the inhabitants of the State of New York, or others lawfully within the borders of the said state.

34. And these defendants, further answering, show that the laws of the Government of the United States, regulating the discharge and deposits of refuse, dirt, ashes, cinders, sand, dredging, sludge, acid, or other matter of any kind in the tidal waters of

the harbor of New York or its adjacent or tributary waters or those of Long Island Sound, expressly except the matter flowing from streets and sewers and passing therefrom in a liquid state in the tidal waters of the harbor of New York or its adjacent or tributary waters, including those of Long Island Sound.

35. And these defendants deny that the matters and
79 things charged in said bill of complaint not herein and hereby well and sufficiently answered, traversed, or denied, are true, and they ask that the complainant's prayer for a writ of injunction be denied, and that they may be hence dismissed with their reasonable costs and charges in this behalf expended.

(Signed) STATE OF NEW JERSEY.
[SEAL.] JOHN FRANKLIN FORT, *Governor.*

Attest;
J. B. R. SMITH,
Assistant Secretary of State.

(Signed) PASSAIC VALLEY SEWERAGE COMMISSIONERS,
[SEAL.] JULIUS A. LEBKUECHER, *President.*

Attest;
JOHN S. GIBSON, *Secretary.*

(Signed) EDMUND WILSON,
Attorney General, Attorney for and of Counsel with State of New Jersey.

(Signed) ROBERT H. McCARTER,
Of Counsel.

(Signed) JOSEPH COULT,
(Signed) CHANDLER W. RIKER,
Attorneys for and of Counsel with Passaic Valley Sewerage Commissioners.

80 STATE OF NEW JERSEY,
County of Mercer, ss:

The answer of the defendants, the State of New Jersey, and Passaic Valley Sewerage Commissioners, was taken before me this fourth day of January, in the year nineteen hundred and nine and was attested by the signature of the Honorable John Franklin Fort, the Governor of the said State, and by J. B. R. Smith, its Assistant Secretary of State, and by the great seal of the said State of New Jersey thereto affixed and was duly attested by the signatures of the Honorable Julius A. Lebkuecher, President of the Passaic Valley Sewerage Commissioners, and of John S. Gibson, Secretary of the said commissioners, and by its corporate seal thereto affixed.

(Signed) WILLIAM M. LAMING,
Judge of the District Court of United States for the District of New Jersey.

81 I hereby certify the following to be a true and correct copy of the grant made by the State of New Jersey to The United States of America of lands under water surrounding Ellis Island in New York Bay, Hudson County, New Jersey, and of the map thereto attached, under date of November 30th, 1904, as the same is on record in the office of the Riparian Commission of New Jersey, at Jersey City, N. J., in Liber Q, page 46 &c.

[SEAL.] (Signed) JOHN C. PAYNE, *Secretary.*

Dated Jersey City, N. J., December 21st, 1908.

82 THE STATE OF NEW JERSEY:

To all to whom these presents shall come, or may concern, Greeting:

Whereas Pursuant to an act of the Legislature of said State, approved February 10th, 1891, entitled "A further supplement to an act entitled 'An Act to ascertain the rights of the State and of riparian owners in the lands lying under the waters of the bay of New York and elsewhere in this State,' approved April eleventh, one thousand eight hundred and sixty-four.",' and other acts and joint resolutions of the legislature of said State, The United States of America, being the owner of lands comprising what is known as Ellis Island in the Bay of New York, County of Hudson and State of New Jersey, which lie above high water mark and in front of which the lands under water hereinafter described are situated, has applied to the Riparian Commissioners of said State for a grant of the said lands under water, and to have the said Commissioners fix the boundaries of the said lands under water, and determine the price or compensation to be paid to the said State thereof, and the terms and conditions of said grant:

And whereas, the said Riparian Commissioners, to wit: Franklin Murphy, Governor, William Cloke, Robert Williams, M. F. McLaughlin and John R. Reynolds, having due regard to the interests of navigation and the interests of the State, have agreed to grant the lands under water hereinafter mentioned upon the terms herein set forth, and have determined the sum of One Thousand Dollars ($1,000.00) as the price or reasonable compensation to be paid to the State for the said lands.

Now Therefore, the said State of New Jersey by the said Riparian Commissioners, the Governor approving, in consideration of the premises, the terms and conditions hereinafter contained

83 and the said sum of One Thousand Dollars ($1,000.00) paid in cash by the said The United States of America to the said State, the receipt whereof is hereby acknowledged, does hereby grant, sell and convey, unto the said The United States of America, all the right, title, claim and interest of every kind, of the State of New Jersey, in and to All that parcel of land, all of which was formerly and part of which is now flowed by the tide waters of New York Bay, in the County of Hudson and State of New Jersey, described as follows:

Beginning at a point in the Pierhead and Bulkhead line established around Ellis Island, in the Upper Bay of New York, by the

United States Government, September 12, 1904, and adopted October 26th, 1904, by the Commissioners appointed under the authority of the act entitled "An Act to ascertain the rights of the State and of Riparian owners in the lands lying under the waters of the Bay of New York and elsewhere in this State," approved April 11th A. D. 1864, and the supplements thereto; said point bearing north 15° west, two hundred and thirty (230) feet, from a fixed point or mark now situated in the northerly corner of existing crib or bulkhead of Ellis Island; thence, following said Pierhead and Bulkhead lines, south 53° west, one thousand, eight hundred and sixty (1,860) feet to a point; thence, following the said line at right angles south 37° east, one thousand one hundred and twenty-five (1,125) feet to a point; thence following said line, at right angles north 53° west, one thousand eight hundred and sixty (1,860) feet to a point; thence, following said line, at right angles north 37° west, one thousand one hundred and twenty-five (1,125) feet to the point of beginning, making a parallelogram one thousand one hundred and twenty-five (1,125) feet by one thousand eight hundred and sixty (1,860) feet as shown upon the official map of the War Department marked "Pierhead and Bulkhead Lines for Ellis Island, New Jersey, New York Harbor, as recom-
84 mended by the New York Harbor Line Board, June, 1890," said lines having been extended at various times as indicated on said map, by the Secretary of War, the last extension having been made September 12, 1904. A plan showing the boundaries of said grant is attached hereto and made a part hereof.

Together with all and singular the hereditaments and appurtenances thereunto belonging.

To have and to hold all and singular the above granted and described lands under water and premises unto the said The United States of America, in fee simple, forever.

It is distinctly understood and agreed that by accepting the within grant The United States of America does not waive any rights or privileges which it would possess had not the same been accepted, and that no rights of the grantee of any kind whatsoever shall be prejudiced by such acceptance.

In Witness Whereof, The said Commissioners have hereunto respectively set their hands, and these presents have been signed by the Governor and the Great Seal of the State has been hereunto affixed and attested by the Secretary of State, this Thirtieth day of November in the year Nineteen Hundred and Four.

[The Great Seal of the State of New Jersey.]

FRANKLIN MURPHY, *Governor.*
WILLIAM CLOKE.
ROBERT WILLIAMS.
M. F. McLAUGHLIN.
J. R. REYNOLDS.

S. R. DICKINSON,
Sec'y of State.

Witness,
JOHN C. PAYNE.

85 STATE OF NEW JERSEY,
County of Hudson, ss:

Be It Remembered, That on this Twelfth day of December nineteen hundred and four, before me, the subscriber, a Master in Chancery of New Jersey, personally appeared John C. Payne, who being by me duly sworn on his oath, saith that he saw Franklin Murphy, Governor, William Cloke, Robert Williams, M. F. McLaughlin and John R. Reynolds, the within named Commissioners, sign and deliver the within deed as their voluntary act and that he, the said John C. Payne, thereupon subscribed his name as an attesting witness thereto.

JOHN C. PAYNE.

Sworn and subscribed before me, at Jersey City the day and year aforesaid.

GEORGE L. RECORD,
Master in Chancery of New Jersey.

(Marked page 85½.)

(Here follows map marked page 85½.)

86 SCHEDULE 2.

Certified Copy.

Riparian Commission of New Jersey.

Recorded in Liber Q, Folio 46, &c.

The State of New Jersey to the United States of America.

Grant.

Dated November 30th, 1904.

87 Whereas, on the sixth day of January in the year eighteen hundred and eighty, application was made by John C. Duane, Brevet Brigadier General of the United States Army, and Engineer of the Second and Third Light-House District, a duly authorized agent of the United States of America, to his Excellency, George B. McClellan, Governor of the State of New Jersey, for the cession by the State of New Jersey, to the United States of America for Lighthouse purposes, of the land covered by the tidal waters of the Bay of New York, upon which the lighthouse known as the "Robbins Reef Lighthouse" is erected described as in said application, which said land so covered by the tidal waters of the Bay of New York is within the territorial limits of the State of New Jersey, being in the City of Bayonne, in the County of Hudson, and State of New Jersey aforesaid,

And Whereas, in pursuance of the Act of the Legislature of the State of New Jersey entitled "An act authorizing the cession of jurisdiction and conveyance of lands of this State under tidal waters to be used as sites for lighthouses, beacons, and other aids to navigation" approved March 16th, 1875, the Riparian Commissioners of this State, at the request of his Excellency, George B. McClellan, Governor aforesaid, have caused a survey of the land required for that purpose to be made, and have reported a map and description thereof, from which it appears that the land applied for, and to be used as a site for a light house is within the territorial limits of the State of New Jersey, as said limits are defined in and by the treaty between the States of New York and New Jersey, made September 16th, A. D. 1833, and embraces the location where the lighthouse known as the "Robbins Reef Lighthouse" is now constructed:

88 Now, Therefore, I, George B. McClellan, Governor of the State of New Jersey, for the State of New Jersey, and the State of New Jersey by me Governor as aforesaid, in consideration of the premises and of one dollar to me in hand paid by the United States of America have, and by these presents do, cede to the United States of America, for lighthouse purposes, the title of the State of New Jersey with the qualifications and reservation hereinafter set forth, over the land covered by the tidal waters of the Bay of New

York, where the lighthouse structure known as the "Robbins Reef Lighthouse" is now erected, which land so covered by the tidal waters of the Bay of New York as so surveyed is described as follows:

All that certain tract of land, lying under the tidal waters of the Bay of New York in the City of Bayonne in the County of Hudson and State of New Jersey, being on the shoal know as "Robbins Reef" making out from the New Jersey shore, and lying westerly of the main channel of the Bay of New York, the said tract of land under said tidal waters (colored yellow and marked "L. H." on the accompanying map) being embraced within a circle of seven hundred feet in diameter, the centre point of which is the light-house tower of the "Robbins Reef Lighthouse" and is distant six thousand six hundred feet, in a course north eighty-seven degrees east, from the most easterly projection of the point of land known as "Constables Point" in the City of Bayonne, in the County and State aforesaid and contains eight and eighty-three one hundredths of an acre (8 83/100 Acres).

Provided always, that the cession made hereby, is made with the express agreement that no part of said premises shall be used for quarantine purposes, and with the further proviso and agreement, that if the United States of America shall at any time cease
89 to use said premises for the purposes of a lighthouse, the same shall, as to all right, title and interest hereby ceded, revert and again become the property of the State of New Jersey.

In Witness Whereof, the State of New Jersey by the Governor thereof, and I, George B. McClellan, Governor of the State of New Jersey, execute this deed by the hand of said Governor, and have caused the Great Seal of the said State of New Jersey to be duly affixd hereto, this fourteenth day of February in the year one thousand eight hundred and eighty.

[The Great Seal of the State of New Jersey. MDCCLXXVI.]

(Signed) GEO. B. McCLELLAN, *Governor.*

Attest:

HENCY C. KELSEY.

(Signed) EXO BOWLEY.

Received in the office of the Register of the County of Hudson, N. J., on the 20th day of February, A. D. 1880, at 9.15 o'clock A. M., and Recorded in Book 342 of Deeds for said County on page 673, &c.

(Signed) J. B. CLEVELAND, *Register.*

90 SCHEDULE I.

Special Report of Passaic Valley Sewerage Commissioners to the Governor of the State of New Jersey.

Submitted June 8, 1903, With Letter of C. W. Raymond, Lieut. Col., Corps of Engineers, and Reports of Gen. Henry M. Robert, G. S. Greene, Jr., C. E.; E. W. Harrison, C. E.; O. H. Tittmann, Superintendent; William Barclay Parsons, Consulting Engineer, and Allen N. Spooner, C. E.

Baker Printing Company, Newark, N. J.

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92 *Special Report of Passaic Valley Sewerage Commissioners.*

To His Excellency, Franklin Murphy, Governor of New Jersey:

SIR: By an Act of the Legislature of this State, entitled "An act to relieve from pollution the rivers and streams within the Passaic Valley sewerage district, established and defined by an act of the Legislature entitled 'An act to create a sewerage district to be called the Passaic Valley sewerage district,' approved March twenty-seventh, one thousand nine hundred and two, and for this purpose establishing therefor a district board of commissioners, defining its powers and duties and providing for the appointment, terms of office, duties and compensation of such commissioners, and further providing for the raising, collecting and expenditure of the necessary moneys," which act was approved April 22nd, 1903, it is provided in the fifth section thereof that "before any moneys expended or obligations are incurred for the construction of any trunk or outlet sewer which shall discharge into New York Bay, the said board shall carefully investigate whether said discharge is likely to pollute the waters of said bay within the jurisdiction of the State of New York to such an extent or in such a degree as to cause a nuisance to persons or property within said State, and

shall present the result of their investigation to the Governor with their opinion thereon and the reasons for their opinion."

In obedience to the provision above quoted we, the Passaic Valley Sewerage Commissioners, respectfully report to your Excellency that we have, since the enactment of the said law, carefully
93 investigated whether the discharge from the trunk or outlet sewer provided for in the said law is likely to pollute the waters of said bay, within the jurisdiction of the State of New York, to such an extent or in such a degree as to cause a nuisance to persons or property within said State. The result of our investigation is that the said discharge is not likely to pollute the waters in said bay, within the jurisdiction of the State of New York, to such an extent or in such a degree as to cause a nuisance to persons or property within said State.

The undersigned recognized the fact that the question presented to them in the said law for solution was one for scientific investigation and careful research, and that it was necessary to call to our aid men who, through education and training, as well as from personal knowledge of tidal flow and current courses in the Bay of New York, were peculiarly qualified to supply the needed information. We were particularly fortunate in securing the services of engineers, not only of the highest personal character and professional reputation, but men who have made a study of the conditions existing in the Bay of New York. We directed these gentlemen to carefully investigate and report upon the identical question submitted to us for determination. Their reports, made after such investigation, are attached to this report and made a part of the same.

General Henry M. Robert is recognized as one of the most eminent engineers of this country. He is a graduate of West Point, has to his credit a service of forty-four years as an officer in the engineering department of the military branch of the service, and when placed on the retired list, in 1901, occupied the high position of Chief of Engineers of the United States Army. He was for many years a member of the Harbor Line Board of New York,
94 and for a number of years he was president of the board. The performance of the duties imposed upon him by this position made him thoroughly familiar with the Bay of New York, its tidal flow, the courses and conditions of its currents, and similar conditions in adjacent waters. He is, and was at the time of his employment by the commissioners, perfectly acquainted with conditions existing in the Bay of New York at the point selected for the outfall of the trunk sewer.

Mr. George S. Green, Jr., is an engineer of high standing in the profession. For many years he was a member of the Dock Department of New York City, and from 1875 to 1898, for a period of twenty-two and one-half years, he held the position of Engineer in Chief of the Department of Docks of that city, and while in that position he studied and observed the waters of the harbor and their movements, and the result of sewage discharged into the waters of the harbor and other matters concerning its welfare.

Mr. E. W. Harrison, of Hudson County, New Jersey, is an engineer of eminence. Prior to his employment by us he had made a personal study of the Bay of New York, with reference to the identical question before the commission.

We have also had the benefit of a report made by Engineers, Messrs. Rudolph Hering, J. J. R. Croes and William M. Brown to the State Sewerage Commission, and which is contained in the report of that commission to the Legislature of 1902.

Shortly after the appointment of this commission we communicated with the authorities of the general government, with a view of ascertaining if there was any likelihood of federal interference with the contemplated project. The matter, after passing through the various channels of the War Department, came to the hands of Lieutenant-Colonel C. W. Raymond, and his report, in the
95 form of a letter, is attached hereto and made a part of our report.

We have also consulted with our engineer, Mr. Rudolph Hering, whose views on this particular question are given in his report which is included in the report made by the commissioners to the Legislature at its last session. An extract therefrom, with page reference, is attached hereto.

There has been brought to our consideration an article which we have ascertained was prepared by Mr. Alfred D. Flinn, managing editor of the Engineering Record, and published in that journal under date of May 2nd, 1903, a copy of an extract from which article is appended to this report.

There has also been obtained from Mr. O. H. Tittmann, Superintendent of the United States Coast and Geodetic Survey, Washington, D. C., a statement showing the tidal flow through the Narrows, East River, and Kill von Kull. A copy of this communication is also attached.

In addition to these inquiries and studies, we have made a personal inspection of the locality of the proposed outfall, and have noted the distance of the location from the various points of land in the vicinity, and from the territory of New York.

The distance at which the outfall pipe sewer is located from the territory of New York State; the character of the sewage to be discharged; the preliminary screening it is to be subjected to; the depth of water at the outfall; the insignificant quantity of sewage when compared with the immensity of the tidal flow as shown by the reports annexed; the opinions of the eminent engineers consulted by us, and whose reports are appended; the facts stated by Mr. Hering in his report to the commission, which is included in the report made by the commissioners to the Legislature at its last session; the facts stated in the various reports, letters and articles to which reference has been made herein, and which
96 are appended hereto; and the information which we obtained from an examination and inspection of the locality where it is proposed to locate the outfall sewer pipe, are the reasons for our opinion that the said discharge is not likely to pollute the waters in said bay, within the jurisdiction of the State of New York, to

such an extent, or in such a degree as to cause a nuisance to persons or property within said State.

Respectfully submitted this eighth day of June, 1903.

[SEAL.]

JULIUS A. LEBKUECHER,
FRANCIS CHILD,
PETER HAUCK,
JOHN HINCHLIFFE,
WM. McKENZIE,
Commissioners.

Attest:
JOHN S. GIBSON, *Clerk.*

Report of Gen Henry M. Robert.

HAWORTH, N. J., May 19, 1903.

The Passaic Valley District Sewerage and Drainage Commissioners, Newark, N. J.

GENTLEMEN: In compliance with your request for my opinion as to whether the discharge of the sewage of the Passaic Valley District into New York Bay, according to the plan of Mr. Rudolph Hering contained in your annual report of 1903 to the Legislature, is likely to pollute the waters of said bay within the jurisdiction of the State of New York to such an extent or in such a degree as to cause a nuisance to persons or property within said State, I
97 have the honor to submit the following:

The present population of the Passaic Valley Sewerage District is nearly 510,000 and the sewage to be disposed of daily amounts to about 107,000,000 gallons, on the liberal basis of a daily average of 210 gallons of sewage per inhabitant. The plans, however, provide for eventually disposing of three times this quantity of sewage or nearly 330,000,000 gallons daily, accommodating a population of over 1,500,000.

The proposed point of discharge is in New York Bay about three-quarters of a mile north of Robbins Reef Light, where there is about seventy feet of water and a good current. It is proposed to place the outlet pipe 40 feet below mean low water. These arrangements are excellent to diffuse the sewage before it rises to the surface.

All the sewage enters the trunk sewer above the main pumping station, and is to be thoroughly screened before being pumped. This will ensure the removal of floating matter, which is not done with the sewage now discharged into New York Bay. It is also understood that means will be taken to keep out of the sewers a large amount of the silt removed from the streets by heavy rains.

As a result of all these measures the sewage will probably be more nearly free from impurities and objectionable matter than the average sewage of American cities, and will be discharged into New York Bay at the depth of forty feet where the water is deep and the current good.

The average ebb tide of the Hudson River at 39th street is about

7,000 million cubic feet, and the ebb at the Narrows (which includes East River) is about 13,800 million cubic feet, or twice as much as the Hudson alone. The full capacity of the proposed sewage system is about 330 million gallons, or about 44
98 million cubic feet.

The sewage will not be evenly distributed over the twenty-four hours, and so to be perfectly safe let us propose that the total amount of daily sewage has to be disposed of by one ebb tide, and that that tide is equal to the ebb tide of the Hudson River at 39th street. We would then have 44 million cubic feet of sewage to be carried away by 7,000 million cubic feet of water in the ebb tide, which would certainly be ample to prevent the sewage from proving a nuisance.

Before the sewage can reach any place where shell fish are cultivated it is believed that it will cease to be harmful.

In this connection it may be well to notice the fact that New York Bay now receives more than double the amount of sewage that the proposed sewerage system can possibly discharge into the bay, and that if the proposed plan were today in operation it would not add fifteen per cent. to the sewage now discharged into the waters of New York Harbor.

In conclusion I would say, that it is my deliberate opinion that the discharge of the sewage of the Passaic Valley District into New York Bay according to the plan of Mr. Rudolph Hering contained in your annual report of 1903 to the Legislature of New Jersey, will not pollute the waters of said bay within the jurisdiction of the State of New York to such an extent or in such a degree as to cause a nuisance to persons or property within said State.

Respectfully submitted,

HENRY M. ROBERT.

99 *Report of George S. Greene, Jr.*

NEW YORK, May 16th, 1903.

Hon. Julius A. Lebkuecher, Chairman Passaic Valley Sewerage Commission, 432 Prudential Building, Newark, N. J.

SIR: In accordance with your request I have read and examined the report of Mr. Rudolph Hering, dated 13th December, 1902, to the chairman and members of the Passaic Valley Sewage and Drainage Commission, with a view of forming an opinion as to whether the discharge of sewage into the waters of the New York Harbor would or would not create a nuisance to the inhabitants of New York or be in any way detrimental.

The maximum quantity of sewage (and that only when the population is treble what it is now), estimated to be discharged at the outfall is 345,830,000 gallons (page 39 of the report), equal to 46,110,666 cubic feet per day.

In U. S. Coast Survey Report of 1886, page 36, occurs the following:

Tidal Flowage N. Y. Harbor.

Epitome of Results for Discharge 25th June, 1886.

East River (19th street):

	Cubic feet.
Ebb (westerly)	4,454,937,257
Flood (easterly)	4,007,175,676
Excess of ebb	447,761,581

Hudson River (39th street):

	Cubic feet.
Ebb (southerly)	6,996,678,413
Flood (northerly)	6,225,985,545
Excess of ebb	770,692,868

100

Kill von Kull (West New Brighton):

Ebb	1,790,103,372
Flood	1,712,415,362
Excess of ebb towards the Harbor	77,688,010

Narrows:

Ebb (seaward)	13,819,895,144
Flood	12,703,616,481
Excess of ebb	1,116,278,663

Other sections concur remarkably well with these which are selected as the best.

	Cubic feet.
Fresh water discharge of Hudson at 39th street, Aug. 11 and 12, 1865	385,346,424
Fresh water discharge of Hudson at Dobbs Ferry, Aug. 19 and 21, 1865	373,426,507

From the above the total flowage into and out of the upper harbor through the Narrows is about 13,800,000,000 cubic feet twice in 24 hours or a total of 27,600,000,000 cubic feet per day.

As the discharge or outfall of the sewage is to be on the westerly side of the main channel, and as there will be no sufficient force to push the sewage across the current of the channel, it is not proper to consider for localities above the Narrows this total volume of the water passing in and out of the upper harbor as that available for diluting or dissipating the sewage.

The North or Hudson River flowage may, however, fairly be taken as available for such purpose because the main if not the total volume of such flowage passes directly by the outfall or discharge pipe, and as the water of the ebb tide consists in large part of the water of the flood tide only the flowage of the ebb tide is taken into account.

101 The volume of flowage of the North River as given above on the ebb tide is about 7,000,000,000 cubic feet, or 14,000,000,000 cubic feet per day into which the sewage is to be discharged.

The volume per day of sewage discharged being 46,000,000 cubic feet and the volume of flowage per day being 14,000,000,000 cubic feet, the sewage is 1,304 or 0.00328 of the volume of flowage, in other words, less than 1-3 of 1 per cent. It is obvious, I think, that such a small amount of sewage in so large an amount of other water can have but little effect, if any that is perceptible to the senses.

In Rafter & Baker's "Sewage Disposal of the United States," page 15, the average composition of sewage in the United States is given as 998 parts water, one part mineral matter and one part organic matter in 1,000. The mineral matter is carried for some time in suspension but finally settles to the bottom, while the organic matter is soon reduced to elements.

It is proposed in this sewage to use screens, to catch the floating material, and silt catchers to retain the heavier material; and therefore this sewage will probably have considerably less of mineral and of organic matter than the average sewage.

If it is considered the same, that is, 1 part in 1,000 of each mineral and organic material, the daily discharge of the sewage would contain 46,000 cubic feet of mineral or solid matter, which spread evenly over the bottom of 1,000 acres would make a layer of about 1-1000 of a foot thick or 365-1000 of a foot per year. The area over which such material would be distributed would be many thousands of acres and the excess of 71,000,000 cubic feet of ebb tide flowage over flood tide flowage on the Hudson River, as shown in the Coast Survey Report quoted above, would carry much of it out to sea before falling to the bottom.

102 The area of the upper harbor (above the Narrows), of New York, is 26 square miles or about 16,640 acres.

Aside from the insignificance of the deposit of sewage, so far as New York interests is concerned, is the fact, that the outfall or discharge of the sewage is on the westerly side of the main channel and there is no sufficient force to push or carry the sewage across the axis of the current in the channel, and therefore the sewage, with whatever mineral or other matter it may contain, will be carried entirely along the shore of New Jersey, except for the short stretch of the Narrows, one side of which is Staten Island, where the current is strangest and will carry such matter past Staten Island and out into the lower bay or the ocean.

In addition to simple dilution by discharge into the large volume of current I consider the plan of discharging the sewage at a depth of forty feet below the surface of value, because the sewage being fresh water and lighter than salt water has a tendency to rise, and in

rising it will spread and be diffused, thereby increasing the dilution and dissipation of the sewage.

For the reasons above given I am of the opinion that the proposed discharge of sewage will not cause any nuisance to the people of New York or be in any substantial or consequential way detrimental to their interests.

Respectfully submitted.

(Signed) G. S. GREENE, Jr.

103 *Report of Edlow W. Harrison.*

Earle & Harrison, Civil Engineers, 15-21 Exchange Place, Jersey City, N. J.
Frank H. Earle.
Edlow W. Harrison.

May 29th, 1903.

Hon. Julius A. Lebuecher, Chairman, and Members of the Passaic Valley Sewerage and Drainage Commission, Newark, N. J.

Gentlemen: In conformity with your request, contained in a letter from Mr. John S. Gibson, dated May 20, 1903, that I should make a report to you, and give my opinion as to the likelihood of the discharge of the contemplated sewer, proposed to be built under your direction, polluting the waters of New York Bay, within the jurisdiction of the State of New York to such an extent, and in such a degree as to cause a nuisance to persons or property within said State, I have the honor to say as follows:

I have made a careful study of the act approved April 22, 1903, authorizing said sewer, and also the report of your commission to the Legislature, Session of 1903, and the annexed report of your Chief Engineer, Mr. Hering, and the plans attached thereto.

As I understand the proposition, it is intended to receive and convey all foul and polluted water now entering the Passaic River from near Great Falls in Paterson, to a point of final disposal into the waters of the upper bay of New York, near Robbins Reef Light, within the State of New Jersey, and to quote the terms of Section 4 of the act "which place, or places of deposit, discharge, or outfall shall be, at least, one and one-quarter miles, measured at right angles in an easterly direction from the exterior line for solid filling in New York Bay as now established by the Riparian Commission of this State, and in a tidal channel of not less than forty feet in depth at mean low water."

104 I find, by producing the line shown upon the map accompanying your engineer's report, into the waters of New York Bay, in the direction called for by the act, that the depth of forty feet in the main channel of the bay, will be reached at a distance of approximately 7,500 feet, or 1.42 miles outside of the exterior line for solid filling, and this point is about 2,000 feet, measured upon the same line produced, from the State Line, and within the boundaries of the State of New Jersey. Between the boundary line of the State of New Jersey and the point of outfall,

lies the main channel of the bay, which is here seventy-five feet deep at low water.

I also understand that the works contemplated by you, are to have a maximum capacity sufficient to accommodate a population of 1,500,000 people, and are to be capable of discharging into the bay, when completed, 326,000,000 gallons each twenty-four hours, but that the first outfall pipe under New York Bay is only to have a maximum capacity of 120,000,000 gallons per day.

It is also understood that all except the first flow of the street washings in a rain storm, and all ground waters as far as possible, are to be excluded from this sewer, and that the plant is to be provided with silt catchers and screens to hold back, break up, or remove any floating matter which might pass into the bay.

The upper bay of New York, with the East River, and the lower reaches of the Hudson River in front of the City of New York, now receives sewage from a population of approximately 4,500,000 people.

By the consummation of your plans, there will be added to this sewage, at once, sewage from, approximately, a population of 500,000 more.

The proper consideration of the problem presented, requires—
first, that the present effects of the discharge of this large
105 quantity of sewage in the rivers and bay, be studied, also the effect of the present addition proposed by your plan, and lastly, the probable effect of a large increased discharge from all sources in the same basin with the future growth of population, and the probable limits beyond which such increase cannot go without danger of creating a general nuisance.

In this study, the tidal basin and all the sewerage systems now, or proposed to be made tributary to it, must be considered as a whole. After this is done, the more limited, or local effect of the system contemplated by your commission, upon the situation, may be studied.

In order to arrive at a basis of comparison, the amount of sewage per head, may be taken at the average water supply per head per diem in the communities served. This is about 100 gallons per person.

Your engineer has designed your sewer on a basis of about 217 gallons per person per diem, for a maximum service of 1,500,000 persons. A maximum discharge is provided for, of 326,000,000 gallons per day, but this computation allows for foul street washings and a certain proportion of ground water which cannot be prevented from reaching the sewers.

Experiments and experience have shown that in the sewage of eastern American cities, this 100 gallons per head will contain about 1-1000 part of organic matter and about the same of inorganic or mineral matter, or about a little less than one pound of organic matter to each person per day, this including the discharge from water closets, privies, sinks, and other house drainage, and a proportionate amount of the organic matter from the foul water of the street and manufacturing establishments, any increase

in liquid tending to reduce the proportionate amount of organic matter.

A very large part of the sewage to be expected from the drainage district of the Passaic Valley, especially in the upper section,
106 will be discharge- from manufactories, but a very large proportion of this discharge is inorganic.

Accepting for computation, this basis of 100 gallons per head, we find there will be, on completion of your works, discharged into the rivers and bay forming the harbor of New York, from the cities of New York, Jersey City, Hoboken, and other towns in Hudson County, N. J., and the area drained by the proposed sewer, about 500,000,000 gallons of sewage per day, based upon 100 gallons per head, carrying with it rather less than 5,000,000 pounds of inorganic matter.

Almost all of the present sewage now reaches the outfall of the river or bay, practically fresh, and the plans proposed for your sewer are such that this will be the case for the sewage from the Passaic Valley district. The sewage will have such a velocity in the sewage, as to reach the outlet before any extensive bacterial action has operated upon it. Having reached the outlet, its final disposal depends upon the action of several distinct circumstances or forces.

And here, it should be noted that a discharge into a tidal estuary of the character of New York Bay, open to the free movement and influx of the salt water of the ocean, presents an entirely different proposition from the discharge of sewage into a running fresh water stream, no matter what the volume of that stream may be, and the limitations as to allowable proportion of sewage to the volume of flow, the rapidity of current, depth of stream, conditions as to use of water below for potable purposes, and the variations of freshet and low water flow, do not apply.

The final disposal of sewage delivered into New York harbor is accomplished by a number of forces and influences:

First. Dilution by the salt water.

Second. Chemical; the antiseptic effect of salt water upon the organic constituents of the sewage, and their oxygenation by the dissolved oxygen in the water, and the precipitation of
107 these constituents by the salts contained in the sea water.

Third. The consumption of the organic matter in the sewage, as food, by the marine life with which the water teems and

Fourth. Transportation from the period of discharge into the great reservoir of the ocean, by the tidal current.

Dilution.

As to the measure of dilution—we have seen that, including the first works to be built by you, the discharge of sewage of standard strength into the harbor of New York, will amount to 500,000,000 gallons per day. That is, reduced to cubic feet, about 67,000,000 cubic feet.

The tidal estuary of New York bay, considered as a reservoir

basin within the Narrows, omitting the Kill von Kull and waters west thereof, may be considered to be made up of the upper bay, from the Battery to the Narrows; the East River from the Battery to Hell Gate, and the Hudson River from the Battery to 140th Street.

The area of the upper bay is about 551,000,000 square feet.

The area of the East River to Hell Gate, is about 98,000,000 square feet.

The area of the Hudson River to 140th Street, is about 224,000,000 square feet, making in all 873,000,000 square feet, or about 30.5 square miles. The average depth of the bay at low water is 26 feet; of the East River, about 38 feet, and of the Hudson River, about 31 feet.

There is contained in this basin, to the plane of mean high water:

In the upper bay, about 17,000,000,000 cubic feet.

In the East River, 4,264,000,000 cubic feet, and

In the Hudson River, 8,000,000,000 cubic feet, making in all 29,264,000,000 cubic feet.

108 The ebb discharge through the Narrows, each tide, as computed by the U. S. Coast Survey, and contained in report of 1886, pp. 36, was, in the month of June, after all spring freshet flow of the tributaries had ceased, 13,820,000,000 cubic feet, or in twenty-four hours, twice this amount, or 27,640,000,000 cubic feet.

Thus it will be seen that each day there is discharged from the harbor of New York, into the great expanse of the lower bay and the ocean, a volume of water almost equal to the total cubical contents of the bay and two rivers south and west of Hell Gate and 140th Street; that is, an amount of water, practically equal to all the water contained in this great basin, moves out to sea each twenty-four hours.

Thus into this volume of water, amounting to 29,264,000,000 cubic feet, which is practically changed and refreshed each day, we will have a discharge of standard sewage at 100 gallons per head per person, of about 67,000,000 cubic feet; that is, for each part of sewage, we have 431 parts of river and bay water. Carrying the comparison further, each pound of organic matter will be diluted with 43,100 gallons of salt water.

It may be contended that this comparison is unfair because, by the oscillation of the tides, a certain proportion of the sewage polluted water is carried back into the Narrows and up streams by the action of the flood tide, and the discharge, during the floodtide, is carried up stream and does not start on its journey seaward until the next ebb, and then from a point far above its point of discharge. This, of course, is correct to a certain extent, but this enormous quantity of slightly polluted water, amounting to nearly one-half of the total volume of the basin, which passes through the Narrows in the ebb current, at once mingles with the great body of water in the lower bay and the adjacent ocean. The lower

bay, inside of the bar between Coney Island and Sandy
109 Hook, has a tidal prism of about 14,000,000,000 cubic feet and approximately contains a volume of water, up to the elevation of high tide, exceeding 75,000,000,000 cubic feet.

This water is practically all changed once a day, by the entrance and reflux of the tidal wave of the ocean coming up the coast.

Thus it will be seen that the incoming tide through the Narrows must be largely made up of new water, and such a portion of the sewage polluted water of the upper bay which has passed out in the preceding ebb, and is brought back on the flood, will be so enormously diluted as to be practically ocean water.

Chemical Action.

The second influence acting upon the sewage, is the chemical action of the antiseptic effect of salt water upon the organic constituents, and the oxygenating of the organic matter by the dissolved oxygen in the water, and the precipitation of these constituents by the salts contained in the sea water.

The effect of salt water upon sewage is to retard bacterial action and putrefaction. To a certain extent the organic matter is pickled, and the nuisance arising from its decomposition materially reduced.

This fact has been illustrated for years in the sewage of Jersey City and Hoboken. Practically all of the sewers of these cities on the low lands adjoining the river, are necessarily placed with water runs approximating to the elevation of low water, and with little fall except that secured by the slope of the water surface.

The tide ebbs and flows through the sewers, and at certain periods of the rising tide, the sewage water is locked and held back by the incoming salt water from the river.

Up to a recent period, before the meadows back of the river at the foot of Bergen Hill were filled in, or built upon, many of these sewers discharged their contents, mingled with salt
110 water, into the ditches and meadow creeks, and at the ebb tide, this reservoir of accumulated salt water and sewage flowed back through the sewers to the river.

By reason of the stagnation during the greater portion of the time, the sewers are always filled for about one-third of their capacity, with sludge of house sewage and washings from the streets and are only cleaned by manual labor, the deposits being taken out through manholes. Such a condition of affairs, if the flush-water was fresh, and bacterial and septic action could be given free scope, would produce an intolerable nuisance, and the stench arising from the sewer manholes, which are provided with ventilating holes open to the street, would be noticeable, but, thanks to the salt water flushing, these sewers, as far as the nuisance created by the stench is concerned, are not at all offensive. That this result is due almost entirely to the salt water flushing is shown by the fact that, of late years, since the meadow creeks have been closed up, and the lots on the meadows, to a large extent, filled up or built upon, and the upper ends of the sewers closed so that the tide no

longer discharges upon the meadows and into the ditches, the nuisance arising from decomposed sewage which finds its way into the lower and unimproved portions of the meadows, is much more offensive than was the case when the sewers very often discharged at both ends at once for certain periods of the day.

The salt water also, to some extent, preserves the constituents of the sewage which become food for the marine life in the bay. Certain forms of this life feed upon putrid and septic matter, but other and higher forms, feed upon the portion of the organic matter which has not yet commenced to undergo putrefaction.

The salt water, by delaying putrefaction during the carriage and dissemination of the small particles of organic matter, bring it fresh to the reach of a large number of such marine life, and
111 allow of its easier, and more general and rapid consumption as food, by them.

Oxygenation of the Organic Matter by the Action of the Dissolved Oxygen in the Water.

A hasty test was made a few days ago, of the sample of Hudson River water, taken from a slip about 250 feet away from the principal sewage outlet in Jersey City, where the sewage of about 75,000 people, or about one-third the total population, is discharged at the bulkhead at the end of a long narrow slip, flanked by closely piled piers, extending 1,100 feet into the river. The sample was taken at the beginning of ebb tide. There was little current movement, in fact there is seldom any noticeable current at this point, except that created by the rush of the sewage.

The sample showed 4.2 c. c. of oxygen per litre, or 0.6 parts by weight per 100,000. This is more than one-half the quantity found in pure river water, and sixteen times the quantity found in the Thames at Woolwich, near the outfall of the London main drainage.

A sample from the channel of the river would certainly show very much better. Thus it appears that, even while loaded with sewage of 4,500,000 people, these waters still contain a very large proportion of oxygen, and are far from being saturated with sewage.

Precipitation of Organic Constituents by the Salts in the Sea Water.

The calcium and magnesium salts existing in sea water will decompose and precipitate the soluble soaps in the sewage in the form of soap curds, which are carried to the bottom. This action in a shallow channel, has, at times, caused inconvenience, but in the outfall selected for the proposed sewer, the depth, 75 feet is so great as to do away with any danger of shoaling before
112 the deposits are destroyed by slow decomposition and the action of micro-organisms, on the bottom.

Consumption of the Organic Matter by Marine Life.

The waters of the bay and river swarm with a multitude of forms of marine life, from the lower micro-organisms up to the shrimp and small fish, and a microscopic examination of the water, at the mouth of the sewer above mentioned, showed that, at every atom of organic sewage, some of the variety of scavengers was busily en-aged in breaking it up and devouring it, while, at the outfall, many small fish can be seen stemming the current of sewage and darting forward to seize a tempting morsel. Only the masses of sewage too large to be broken up readily by these little scavengers, are allowed to go very far from the mouth of the sewer, and even those, when they reach the influence of the tidal and wave currents, soon break up.

Microscopic examinations made of the water 500 and 1,100 feet from the sewer mouth, showed proportionately lessened number of micro-organisms, and much less proportion of dead organic matter.

The screening and pumping which the Passaic sewage will be subjected to, will, by breaking up the solids, aid greatly in facilitating this mode of disposal, which is thus commented upon by Dr. H. C. Sorby, in a paper, *Jour. Roy. Micr. Soc.,* (italics) 1884, pp. 988-991, repriinted in "Sewage Disposal in the United States" Rafter and Baker, 1894, pp. 77-79.

Dr. Sorby, after describing his investigation of the work of marine animalculæ in the consumption of organic pollution, says:

"Taking the above facts into consideration, it appears to me that the removal of impurities from rivers, is more of a biological than a chemical question; and that in all discussions of the subject it is most important to consider the action of minute animals
113 and plants which may be looked upon as being indirectly most powerful chemical agents.

Transportation to the Ocean by Tidal Currents.

While the sewage discharged in New York harbor is being largely diluted, and the proportions and power for offense of organic matter materially reduced by the united action of the salt water, micro-organisms, crustacea, and fish, it is subjected to the action of the tidal currents flowing in and out through the Narrows, and though for a few hours, while within the bay and rivers, oscillating back and forth with the changing tides, carried surely down into the great reservoir of the ocean.

The ebb flow, through the Narrows, as before mentioned, is 13,819,895,144 cubic feet. The flood flow is 12,703,616,418 cubic feet. The excess of ebb being 1,116,278,663 cubic feet. The cross section of the Narrows is 271,480 square feet. Assuming the tidal periods to be equal, and six hours in duration, these figures show a mean velocity for the whole section of 1.61 miles per hour, or 9.66 miles in six hours of ebb, and 1.48 miles per hour, or 8.89 miles in six hours of flood. The maximum velocity in the channel

at ebb tide, as measured under the direction of General Newton, U. S. Engineers, in 1872, was 4.5 miles per hour. The ebb flow of the Hudson at 39th street is given by the U. S. Coast Survey Report, 1886, pp. 36, as 6,996,678,413 cubic feet, and the flood volume as 6,225,985,545 cubic feet, the excess of ebb volume being 770,692,868 cubic feet. The approximate cross section of the Hudson at 39th street, contains 173,000 square feet. The above figures give a mean velocity for the ebb current for the period, taken at six hours, and the whole cross section as 1.26 miles per hour, or 7.56 miles in six hours, and for the flood as 1.13 miles per hour, or 6.98 miles for six hours.

The above measurements of tidal flow were made in June. The excess of ebb indicates an average discharge of about 1.15
114 cubic feet per second per square mile of drainage area of the river, or about sixty-five per cent. of the average for a year, due to a total run off of 24 inches on the water shed.

A freshet discharge of ten cubic feet per second per square mile may be expected several times a year from this watershed; such a freshet would much more than double the ebb volume, greatly increase its velocity and duration of flow, and by pushing back the flood, retard its flow, and reduce the time of its influence.

In periods of such freshets, the Hudson River runs ebb for a very large proportion of the time.

The ebb volume of the East River at 19th street, as given in the same Coast Survey Report, is 4,454,937,257 cubic feet, and the flood volume 4,007,175,676 cubic feet, the excess of ebb volume being 447,761,581 cubic feet.

This is the balance of the discharge of Long Island Sound, and the rivers tributary thereto, westward through New York Bay, and the Narrows to the ocean.

Assuming a mean progress of the tidal section along the axis of the channel, as eight miles for each ebb tide, and six miles for each flood tide, which figures for the ebb is much less than the velocity given above for the river and Narrows, but probably justified by the slower progress and cross currents in the broad expanse of the upper bay, and also less *then* same figures for flood velocity in river and Narrows, but also justified because of the same causes, and the fact that the ebb from the East River continues for some time after the flood is running strong from the Narrows, cutting across the bay from Governors Island to the Jersey flats, retarding and complicating the flow, and some portion probably passing up the Hudson River with the direct current; an approximation can be reached *at* as to the average rate at which the sewage deposited in this basin is discharged into the lower bay, and also as to
115 the average proportion of sewage waters present in solution in the upper bay and rivers.

It is probably well within the facts to say that the actual reduction of organic constituents in the sewage, by the action of the several causes already enumerated and the enormous dilution taking place in the lower bay, justifies the assumption that the flood waters entering the Narrows are practically free of sewage pollution, and that

the sewage once outside of the Narrows, may be considered as finally disposed of.

This statement will not apply to the floating corks, wood and other derbis discharged by the sewers, which while of a character to resist the effect of dilution, chemical forces, and marine life, and are not offensive to the senses, some portions may be returned by the tidal flow.

Your plan wisely contemplates the removal and destruction of all floating bodies, before the sewage reaches the outfall.

A study made of the oscillations of the bodies of sewage delivered during the period of each successive tide, at the proposed point of outfall, which is about four miles within the gate of the Narrows, using an average ebb velocity of eight miles in six hours, and an average flood velocity of six miles in six hours, shows that, on an average, at the end of each period of ebb tide, there will be, approximately, twenty-five per cent. of the volume of sewage water discharged in the twenty-four hours preceding, still in solution in the basin of bay and rivers within the Narrows, and at the end of each flood period fifty per cent. of the sewage water discharged during the preceding twenty-four hours, remain in solution.

A similar study of sewage deposited in the Hudson River, at about Castle Point, or ten miles within the Narrows, indicates that, at the end of each ebb tide, there will be one hundred and sixty per cent. of an average twenty-four hours' discharge of sewage water, delivered at this point, still in solution in the basin, and at
116 the end of each flood tide one hundred and ninety per cent of an average twenty-four hours' discharge. That is, the sewage water delivered by your proposed sewer will remain, on the average, only nine hours in the basin, before disposed of outside the Narrows, while New York sewage water, discharged at Twenty-third Street, remains in the basin an average of forty-two hours.

These figures are of course approximate only as to time, but the relative proportion between the storage periods of sewage for each locality will be about as above given, through a wide variety of change in velocity of ebb and flood currents.

A freshet will shorten the period, and may scour the basin clean in one tide; an easterly gale with spring tides, may hold back the ebb and increase the time of storage.

The comparison is also somewhat unfair to the Passaic sewer, as its discharge will be into the strongest and most direct current of the channel, and not into embayed slips, or at the shallow edge of the river.

It must also be taken into consideration that, in the future an increase in the population of New York is not likely to result in a proportionate increase in the volume of sewage discharged in the basin under consideration. The areas of the city tributary to this basin, are now thickly built up and populated. The growth is already greater in proportion in the Bronx, draining east of Hell Gate and the portions of Brooklyn and Queens lying east and south of the Heights, and draining into the sound or toward the lower

bay and the ocean. The greater portion of Richmond, will also, probably, drain into the lower bay and Arthur Kills.

In view of these facts, and the physical conditions existing, I am of the opinion that the discharge of the sewage, contemplated by your plan, into New York Bay, at present, and up to the full extent covered by the plans of your engineer, will not now,
117 or within any reasonable future time, alone, or in connection with the present and future discharge of sewage from the communities now utilizing this place of disposal, cause any noticeable general nuisance to any persons or property whatever, and further more, that the harbor of New York is capable of receiving and disposing of the sewage of from three to five times the population at present utilizing it for such disposal, or from fifteen to twenty-five million people, by properly constructed and distributed outfalls, without becoming so polluted as to become a noticeable nuisance.

Possibility of Local Nuisance.

Though there be no danger of general nuisance, is there any likelihood of the creation of a local nuisance at the point of discharge?

There are many large sewers discharging into the rivers from New York City and the other communities surrounding the harbor, serving populations of upwards of 100,000 people and over. Experience has shown that, practically, the only noticeable nuisance caused by these sewers, has been in cases where the outfall has been above tide level at a bulkhead, where the free action of the tidal currents has been restricted by the obstruction of piers, cribs, and ferry racks, or by vessels drawing from twenty to thirty feet of water, four hundred to six hundred feet long and acting as caisson dams across the tidal flow.

Sewers discharging at the bulkheads, into water of slight depth, and carrying large quantities of foul street washings, with sand and detritus, produce deposits against the bulkheads and in shallow water, forming in time, foreshores exposed at low water.

At many such places, nuisances have been complained of, circumscribed by limited areas, and periods of noticeability, and depending largely for their intensity upon the state of the
118 atmosphere, temperature and tide, and stirring up the sludge deposits by the churning of propellors or paddles.

In all the new piers erected by the city in the past few years, timber flumes have been carried beneath the pier floors out to the tidal currents and deep water, twenty-five to thirty-five feet at the ends of piers, with the result that no further nuisance has been experienced.

In Jersey City and Hoboken, the necessity for the extension of sewers has not yet been felt. The large outlet above mentioned at the foot of Thirteenth Street discharges at the bulkhead into an embayed slip about seven hundred feet north of Pavonia Ferry and the Erie depot. In the frontage between Essex Street and Fourteenth Street, Jersey City, six thousand feet long, and occupied by bridges, piers and walls, and two large grain elevators, besides the ferry slips and depots of the Pennsylvania and Erie Railroads, the sewage

of a population of about 125,000 persons is discharged at the bulkheads.

Beneath the Lackawanna passenger station, in Hoboken, a large main, draining about one-fourth of the area and the most densely populated part of Hoboken, discharges.

No complaints have ever been made to the city authorities as to nuisance arising from these outfalls.

The first outfall proposed by your plan will be situated about one mile southeast, and outside of the outer end of the new Pennsylvania piers at Greenville, the nearest point connected with the New Jersey shore; about one and one-half miles northeasterly from the nearest point on the Staten Island shore; about one and three-quarter miles from the nearest point on the Brooklyn shore, and about three and one-half miles south of the Battery, New York. The nearest point in the State of New York will be 2000 feet away, and covered with thirty-five feet of water. Between this point and the outfall is the main channel of the bay, seventy-five feet deep.

119 The discharge will be below the surface at least forty feet at low water, into this channel.

The experience at Boston has been that, with a much shallower discharge, no appreciable nuisance is noticeable at the point of outfall, and within less then two miles, the presence of sewage cannot be distinguished by chemical tests.

The good effect of the discharge under water, is well illustrated by the experience at the abattoir at the Hackensack River, and at the stock yards in Jersey City. At both these establishments, an intolerable nuisance noticeable to leeward for a long distance, was caused by the stench from the discharge of the steam and hot water from the rendering tanks into the open air. After some experiments, the discharge was changed to outlets as far below the surface of the rivers, as the depth of water would permit, and the nuisance entirely removed.

In an average hour, the proposed sewer, as first constructed, will discharge an equivalent of about 340,000 cubic feet of standard strength sewage, viz: at the rate of 100 gallons per head per day, and containing one part in a thousand of organic matter. In the same hour there will flow past the outlet, a total current in a prism having a volume, limited to a cross section from the surface to the bottom of the bay, and not more than one hundred feet wide outside of point of sewage discharge, of about 31,000,000 cubic feet. It can be well understood how thoroughly the sewage will be diluted before it can reach the surface and become noticeable to the senses of sight and smell.

In the light of all these facts, I am of the opinion that there is not the least likelihood of the discharge of the contemplated sewer, proposed to be built under your direction, polluting the waters of New York Bay, within the judisdiction of the State of New York, to such an extent, and in such a degree as to cause a nuisance to persons or property within said State.

Respectfully submitted,

EDLOW W. HARRISON,
Consulting Engineer.

120 *Report of Wm. Barclay Parsons.*

Wm. Barclay Parsons, Consulting Engineer.
Cable Address, Claybar.

320 Broadway, New York, 25 June, 1903.

Passaic Valley District Sewerage and Drainage Commissioners, the Honorable Julius A. Lebkuecher, Chairman, Newark, New Jersey.
(*Note for Printer—from Passaic to Jersey—italics.*)

Sirs: In accordance with your instructions, I have carefully examined the report of Mr. Rudolph Hering on the proposed methods of sewage disposal for the district under your care, in order to express an opinion as to whether the sewage can be delivered, as proposed by Mr. Hering, at a point in the main channel north of Robbins' Reef Light, without its being an offensive nuisance. On this point Mr. George S. Greene, under date of May 16, has reported to you that the volume of sewage discharge, when it reaches the maximum capacity of your proposed sewer will amount to only one-third of one per cent. of the outward flow of the Hudson River, and would therefore be inappreciable. I have studied the figures on which Mr. Greene bases his opinion and, after such examination, I fully concur with him that the tidal flow is amply sufficient to remove, without offense, the discharge of the sewage contemplated by you, even after the flow reaches the maximum capacity of such sewer.

There are, however, two other questions to be considered; First, the sufficiency of Mr. Hering's allowance for the sewage flow of the district; second, the condition of pollution now existing and the comparative effect of the discharge of your sewage as proposed. According to the last census of 1900, and after making an allowance for growth in the meantime, the area included within the district of your board has a population of about 550,000 persons. What the actual amount of sewage flow from the district is can be estimated only. In the city of New York the amount of water consumed is about 110 gallons per person per diem. At
121 this rate the water supplied in your district would be about 60,000,000 gallons daily, and with an allowance for such storm water and leaks from ground water as enters the sewers, but with no allowance for the cesspools and other sources of water disposal other than cesspools, the sewage flow of your district should not exceed 75,000,000 gallons. On the basis of a population of 1,617,000, or, say, three times the present population, the amount of sewage disposal would be 225,000,000 gallons daily, as against 345,830,000 gallons allowed for in Mr. Hering's plan. His allowance would seem, therefore, to be very generously ample to provide against an increase in population for many years to come—especially as the district authorities will undoubtedly take all

measures to curtail the sewage flow as much as possible, in order to avoid great expense of pumping.

It is at present the custom of all communities situated along the shores of the harbor of New York and the rivers flowing into it, to discharge into such waters raw sewage, without any attempt at either purification or screening. The Hudson River which, except for a short distance on one side near its mouth, is wholly within and under the jurisdiction of the State of New York, is a great gathering outlet for all sewers from Troy southward, a distance of over 150 miles. Omitting, however, everything north of a line drawn east and west at the northern boundary of the city, and thus excluding such growing centres of population as Yonkers and Ossining with their sewage delivery, there lies south of such line what may be terms the Metropolitan District, including the city of New York and the cities of Jersey City and Hoboken. The area of this district that drains into the Hudson, East River and the bay of New York north of the Narrows, is about 162 square miles, and the population living within such area is today nearly four millions. The amount of water consumed within this district is about 425,000,000 gallons daily. On a basis of 42
122 inches of rain fall per annum, the average amount of rain fall would be 324,000,000 gallons daily. On the basis of allowing 50 per cent. of this total to reach the sewers, the total amount of sewage flow for the portion of the Metropolitan District above considered would be 162,000,000 gallons daily, or a total average daily sewer discharge of about 587,000,000 gallons, or nearly eight times the present discharge from your district. As the streets of New York carry a heavier traffic than those in the Passaic District, so will the rain fall portion of the sewage be more polluted, and the communities in the Metropolitan District make no attempt to remove the solid material from the sewage before the discharge.

Finally, there remains to point out the difference in effect on the harbor between the proposed method and the method now in vogue. In the proposed method the sewage would first have all solid matter removed, and would be discharged within the limits of the State of New Jersey at a point in the main channel, and at a depth of about fifty feet below the surface of the water. At present the sewage from this district is turned into the Passaic River, and is discharged by that river into the narrow straits of the Kill von Kull, whence it has to find its way, as best it may, to the sea.

My examination of this question leads me to draw the following conclusions:

1st. Mr. Hering has made a generous allowance for the present and future needs of the Passaic Valley for some time to come.

2nd. That the proposed plan of discharge is much less objectionable than the present method of discharge into the New York harbor via the Passaic River.

3rd. That New York City and other communities located on the

shores of the harbor and the tributary rivers, discharge raw and unscreened sewage into such waters.

123 4th. That at present the volume of Passaic discharge is about one-eighth of the discharge of the Metropolitan district, and will, of course, always remain much less.

5th. That the composition of the Passaic discharge being screened will be much less offensive than the sewage discharge of the Metropolitan District.

6th. That the tidal flow at the proposed point of outfall is amply sufficient to carry the discharged material seaward and prevent a nuisance.

Respectfully yours,

(Signed) WM. BARCLAY PARSONS.

Report of Allen N. Spooner.

NEW YORK CITY, June 11th, 1903.

Hon. Julius A. Lebkuecher, Chairman and Members of the Passaic Valley district Sewage and Drainage Commission, Newark, N. J.

GENTLEMEN: In obedience to your direction of May 29th, 1903, I beg to report that I have approximated the amount of sewage being emptied into the North and East Rivers from Manhattan Island, which eventually finds its way into New York Bay.

These approximations have been based upon, primarily, the amount of water supply, since statistics are not available as to the volume of sewage emptying into the North and East Rivers, the department of Sewers never having procured any data on this subject except as to the sizes of the local sewer openings, where gauging and velocities have been taken. Such figures are of no considerable value, inasmuch as they were taken a number

124 of years ago, and as the water supply per capita has varied greatly within the last ten years, it would seem best to use the water supply as a basis for present calculation.

I propose to show:

First. What volume of sewage is deposited daily in the North and East Rivers and emptied into New York Bay, as the direct resultant from water supply sources.

Second. The amount of sewage which is the resultant of the average daily rainfall throughout the year, which would also enter the North and East Rivers and empty into the New York Bay.

Third. The volume of all other sewage entering New York Bay from other than fresh water sources.

Fourth. The total volume of all sewage, of every description from Manhattan Island entering the North and East Rivers and emptying into New York Bay.

Fifth. The present method of discharging sewage in tide water, and its local and general effect upon the river waters.

Section 1. From the Department of Water Supply of New York City the following figures were obtained as to the amount of fresh water delivered into the city daily from all sources for the month

of January, 1903. During this month 282,000,000 gallons were delivered daily, and, with a population of 2,350,000, the amount per capita was 120 gallons.

From "Sewers and Drains" (page 36) by Julius W. Adams, former Chief Engineer of the Board of City Works, and Consulting Engineer for the Board of Health of Brooklyn, it is estimated that twenty gallons of the per capita amount does not enter the sewers, but is lost in leakage, absorption and evaporation, and in such processes as the extinguishing of fires, street and garden sprinkling, building construction, and in shipping and manufacturing industries. We, therefore, will assume that one hundred gallons of the per capita amount enters the sewers, and, for a population as stated above, would give a total of 235,000,000 gallons discharged daily through the various outlets.

All the sewage deposited during the ebb tides in both the North and East Rivers finds its way into New York Bay but, on the flood tide, a large proportion of that which finds its way to the East River would be carried into Long Island Sound through Hell Gate, Little Hell Gate and the Bronx Kills. We may assume that for twelve hours each day, all the sewage on the east side of Manhattan, between the Battery and Hell Gate, flows into the Sound, and, although the acreage of this portion of the city is not one-half its total area, it is the most densely populated, and I have estimated that one-half the population, 1,175,000 is within this district. As there are twelve hours ebb tide and twelve hours flood tide daily, one-half the volume of the sewage from this section of the city would be discharged into the river and emptied into Long Island Sound. Hence, on the basis of 100 gallons of sewage per capita, there would be 117,500,000 gallons discharged from this east side territory during the twenty-four hours, of which 58,750,000 gallons, as a maximum, would pass into the Sound. In other words, one-quarter of the total amount of Manhattan Island sewage passes into Long Island Sound and three-quarters of it, 176,250,000 gallons, enters New York Bay; the latter figure representing 75 gallons per capita for the total population of 2,350,000.

Sec. 2. The average yearly rainfall in Manhattan may be taken as 42.58 inches, uniformly distributed over its area of 12,567 acres, which amounts to 14,572,158,868, gallons, one-half of which, 7,286,079,434 gallons finds its way into the sewers. (Reference "Sewers and Drains," page 33, by Julius W. Adams, who refers to Mr. Wm. Hayward, engineer, Metropolitan Board of Works, London.) This amount, of course, is not uniformly distributed for each day in the year, as the times and volumes of the storms vary. This amount of rain, however, is deposited as sewage into the rivers, as it carries with it soot, dust, rust, paint, scales from roofs of houses, street sweepings, and also scours the bottoms of the sewers and catch basins, and cannot be considered other than sewage. Therefore, the daily volume of this class of sewage must be reckoned with in addition to the amount of house sewage. By dividing the yearly rainfall by 365 days we obtain a daily volume of 19,961,861 gallons flowing into the North and East Rivers.

On the same assumption, as above outlined, only three-quarters of this amount, or 14,971,395 gallons, will enter New York Bay.

Sec. 3. Along the rivers of Manhattan there is a congested state of shipping, and I would estimate that for deck flushing, and from table refuse, bilge waters, toilets, etc., there are at least 500 vessels using not less than 2,000 gallons daily, or a total of 1,000,00 gallons. To this must — added the salt water used for cleaning purposes in slaughter houses, gas houses, electric plants, oil depots, breweries, grain elevators, dye houses, print works, and various other establishments.

To summarize in regard to this last item, there are five electric plants which use 5,000,000 gallons; five slaughter houses, 500,000 gallons; ten breweries, 1,000,000 gallons; 100 manufactories, 2,500,000 gallons, and gas plants, 1,000,000 gallons—making the estimated amount of salt water used in manufacturing purposes and discharged into the rivers as sewage 11,000,000 gallons.

127 Sec. 4. Adding together the quantities thus estimated we have:

Sewage from the water supply per day.....	176,250,000	gals.
Rainfall per day.....	19,950,000	"
Other sources.....	11,000,000	"
Total.....	207,200,000	"

This total is the estimated average of daily volume of sewage from Manhattan Island entering New York Bay through the North and East Rivers.

Sec. 5. Within recent years, the sewage which was formerly discharged at the exterior line of solid filling—commonly called the "bulkhead," has been carried out to within about 25 feet of the exterior line of the piers by means of creosoted flumes of divers shapes, such as the circle, ellipse and rectangular modifications, which have been adopted to meet the type of sewage openings at the bulkhead.

It is apparent that this method of discharging sewage in a deep and rapid current near the pier head line has removed a nuisance, caused formerly by the discharge at the line of solid filling; for at the latter place the river water is obstructed to such an extent that in a great many of the slips there was so little current that the sewage, deposited on the surface, was not rapidly intermingled with the river water and gave off noxious odors, besides being of an unsightly appearance.

At present, from my personal observation, either when the tide is running strong flood or ebb, the discharge of sewage in the current is not at all perceptible beyond a radius of 500 feet outshore from the pier head line, and is only slightly noticeable even in the adjacent slips. To show you the importance of this, I would advise you that many of the public baths in New York City are within 500
128 feet of sewer openings and adjacent to the piers under which the sewage is carried out. Furthermore, I would call attention to the fact that even where the sewage is perceptible adjacent to the

point of discharge, the water is not contaminated to any great depth, inasmuch as the live teredo (ship worm) has been found in the timbers, used as braces to the piers within 250 feet of sewer openings; also at certain seasons of the year, a small fish, called the "Lafayette" is at some places caught immediately over the openings of sewers of considerable magnitude. From this it will be seen that, in the case of the teredo, which it is claimed will not attack wood in unclean water, the sewage does not pollute the water sufficiently at a distance of 250 feet to annoy them. In the case of the small fishes, which are caught at the mouths of sewers in the tideway, it would show that the water is not contaminated below a few feet sufficiently to prevent the fishes from inhabiting it.

From a rough estimate, I have calculated that there is about one cubic foot of sewage deposited in about 300 cubic feet of clean river water at the mouths of sewers, and that in a current moving 4 miles per hour, there is a mixture, at a point 300 feet from the mouth of the sewer, of about one cubic foot of sewage to 10,000 cubic feet of clean river water. Of course, this is only a rough approximation as to the mixture, but it is ample to state that, from a close observation, in no case have I ever been able to detect, at the distance of 300 feet, except at slack water, any material amount of discolored water, which would denote sewage. I might state as an exception that this does not apply to floating solid matter, which can be traced for some distance at times. However, at 500 feet distance whatever solid material there may be is floating in clean salt water and is not, in any way, deleterious. Although we have estimated the
129 daily amount of sewage going out into New York Bay at 207,200,000 gallons, at Castle Williams, on Governor's Island, there is nothing that I have ever been able to notice which would indicate that the waters were at all polluted by sewage, yet at this point, the waters of the North and East Rivers meet, and as the sewage naturally keeps close to the shores, it would be manifest at this place if at all.

In my discussion, I have treated Manhattan Island alone to make certain that I might be right in deducing the fact that the volume of over 200,000,000 gallons of sewage showed no pollution in the tide water even less than a mile from its shore. In connection with this argument, however, and adding not a little to its force, it must also be assumed that there are at least 100,000,000 gallons of sewage being deposited from the Brooklyn side, which is carried into the same currents.

As it has been estimated by your Chief Engineer, Mr. Rudolph Hering, that, with the present population and its normal increase, the initial volume of sewage reaching New York Harbor from the Passaic Valley Drainage Sewer would be 75,000,000 gallons, discharged at Robbins' Reef, it would be my judgment, from observations of the sewers emptying into the rivers about Manhattan, that there would be no actual noxious pollution of the water in New York Bay beyond 1,000 feet from your proposed outlet. For an estimated amount of 150,000,000 gallons, I do not believe that beyond 1,500

feet from the proposed outlet any sewage would be perceptible, or that the waters would give off any noxious odors.

Inasmuch as there will be an enormous volume of sewage concentrated at the opening of your proposed sewer, and even though it is discharged at a considerable depth below the surface, I cannot conclude that there will not be some noxious conditions im-
130 mediately adjacent to the mouth of this sewer, but, as this is an isolated portion of the bay, I cannot conceive that the sewer would ever be a nuisance to any of the adjacent premises, and it is my opinion that beyond the areas mentioned for the two estimated volumes, the pollution would be practically imperceptible, and that none of the sewage would ever reach any of the adjacent shores in sufficient quantity to be noticeable even in the slightest degree.

Yours very respectfully,

ALLEN N. SPOONER, *C. E.*

Extract from the Report of Messrs. Rudolph Hering, J. I. R. Croes and William M. Brown, Engineers of the State Sewerage Commission, and Continued in the Report of That Commission to the Legislature of 1902, *on Pages* 54 *and* 55.

"The sewage should, therefore, be partially purified, i. e., as far as is practicable, by works on the Newark meadows before being discharged into Newark bay, or it must be carried five miles further and discharged in its raw or crude state into deep water of the upper bay of New York, where there is a large volume of water and a strong current ensuring thorough dilution and inoffensive disposal. * * *

The outfall pipe would leave the shore at an elevation of about twenty feet above high-water, and extend about two miles into the bay, to a point north of Robbins' Reef ledge, practically in the center of the bay, in the vicinity of which the channel is seventy feet in depth."

131 *Letter of Lieut. Col. C. W. Raymond.*

ENGINEERS'S OFFICE, U. S. ARMY,
815 WITHERSPOON BUILDING,
PHILADELPHIA, PA., October 18, 1902.

Mr. John S. Gibson, Secretary, State Sewerage and Drainage Commissioners, Newark, N. J.

DEAR SIR: Since I had the pleasure of conferring with the Sewerage and Drainage Commissioners of New Jersey, on the 1st instant, with reference to a project under consideration for the sewerage of the Passaic Valley District, I have considered the project in its relations to the interests of navigation, and now submit the following suggestions.

As you are doubtless aware the law provides that no changes shall be made nor structures erected in navigable waters of the United States until the plans therefor have been approved by the Secretary

of War. In the present case it appears that the plan is to be submitted to the State Legislature and cannot be submitted to the War Department as an adopted plan until the legislature has approved it. You explained to me that the object of your conference with me was to ascertain, before perfecting a plan, what would probably be the views and requirements of the War Department. As I was instructed by the Chief of Engineers in his indorsement, dated September 11, 1902, on your letter to him dated September 8, 1902, to confer with you on this subject, I feel at liberty to give you my personal views with reference to the project; but it should be noted that I am not authorized to express the views of the War Department, and it cannot be assumed that I shall have any part in the final action of the department upon the perfected plan.

The plan with reference to which my views are desired proposes to take the sewage now emptied into the Passaic River from
132 Newark and Paterson and intervening territory, and convey it to New York Bay. It is given in detail in the report of Messrs. Hering, Cross and Brown, dated December 2, 1901 and the accompanying map, which are published in the report of the Sewerage Commission for 1902. The features of the plan requiring consideration in the interest of navigation are as follows:

1. A trunk sewer near the west bank of the Passaic River from the southerly line of the City of Paterson to near the southerly boundary of the City of Newark, to convey and domestic and manufacturing wastes and a portion of the storm water to a point on the westerly shore of Newark Bay.

2. Cross sewers passing under the bed of the Passaic River to convey the sewage for communities on the east bank of the river to the intercepting trunk sewer on the other side.

3. A pumping plant at the lower end of the trunk sewer near the west shore of Newark Bay and force mains laid under the bed of Newark Bay to force and convey the sewage into a gravity sewer on the Bayonne shore.

4. A gravity sewer from the Bayonne shore to a point in the upper bay of New York near Robbins' Reef ledge to convey and deliver the sewage into the bay.

These features, so far as they relate to the interests of navigation, will now be considered separately.

1. The Trunk Sewer. The elevation of this sewer at different points does not directly affect any navigation interest, but since it must be placed so as to receive the sewage from the cross sewers extending under the bed of the river from the east shore, it should evidently be placed low enough to conform to the levels of these sewers under all probable future conditions of an improved navigable channel. When once established it would be very difficult, if not practically impossible, to lower the trunk sewer.

2. The Cross Sewers. These must be placed below the bot-
133 tom of the channel, as it will exist when the river has been improved in accordance with the adopted project of the War Department. This project provides for a depth of 12 feet at mean low water through Newark Bay and the Passaic River to the Nairn

Linoleum Works in the City of Newark; thence a depth of ten feet to the Montclair and Greenwood Lake Railroad bridge; and thence to the City of Passaic a depth of 7½ feet. The sewers should be several feet below this bottom for their own protection. It is, of course, possible that future projects may provide for increased depths, but I suppose these cross sewers could be lowered without undue expense in case of necessity. In granting a permit for construction, the War Department will probably impose the condition that this lowering, if required, shall be done without expense to the United States. In determining the depth at which these cross sewers should be placed in the upper part of the river, it should be noted that a considerable lowering of the level of mean low water will result from the improvement of the channel.

3. Pumping Plant and Force Mains. The mains passing under Newark Bay must, of course, be established below the bottom of the projected navigable channel. It is understood that the sewage will have to be cleared from grit and heavy insoluble matter before it is pumped, to prevent the destruction of the pipes and pumping machinery.

4. The Outfall in New York Bay. The outfall pipe extends about two miles into the bay to a point where the natural channel has a depth of about 70 feet. There is no artificial channel, existing or projected, in the near vicinity. In view of the fact before noted, that the sewage is to be cleared from grit and heavy matter before it is pumped under the Newark Bay, I am of the opinion that its delivery into New York Bay at the point selected will not injure the channels or be detrimental to the interests of navigation. The outflow pipe, however, should be established as low as possible
134 in order to avoid interference with channels of moderate depth, which it may be found desirable to form in the future to furnish means of communication with wharves on the New Jersey shore.

I hope these suggestions may be of service to the commissioners in perfecting the details of the plan, and it will give me great pleasure to furnish you with any further information in my power.

Respectfully yours,

C. W. RAYMOND,
Lieut. Col., Corps of Engineers.

Extracts from the Report of Rudolph Hering, Engineer of the Passaic Valley District Sewerage and Drainage Commissioners, Contained in the Report of the Commissioners to the Legislature at Its Last Session, on Pages 22 and 39.

"The waters of the Hudson River and the tidal flow from the Lower New York Bay and the East River, together furnish such a large quantity of water that the proper discharge of sewage into the same from a population of many millions cannot be noticed by the senses."

* * * * * * *

"Based on the facts and comparisons above given, I recommended to you a trunk sewer for the joint disposal of the sewage of your

entire district into New York Bay as the most economical and satisfactory project for adoption."

Extract from an Article Prepared by Mr. Alfred D. Flinn, Managing Editor of the Engineering Record, Entitled "The Discharge of Sewage into Harbors and Lakes," and Published in That Journal Under Date of May 2, 1903, on Page 453.

There are places on the seaboard, however, where the direct discharge of sewage may be practiced with impunity. For example, the tidal flow of New York harbor is so great, estimated at billions of cubic feet per day, and the direction of the currents are such that, if the sewage be screened, a very large quantity may be car-
135 ried off without offence. Engineers who have studied this case have concluded that the sewage of 30,000,000 people could be put into the bay from properly located outlets without becoming objectionably apparent. Large volumes and areas of water are not alone adequate to prevent nuisance, the directions, velocities, and volumes of surface currents and the action of wind are also controlling elements. Experience has taught that if locations for outlet can be found where the currents are always favorable, it is better to discharge the fresh sewage continuously, rather than to store it in tanks for intermittent discharge, although the latter practice is sometimes necessitated by the unfavorable directions of currents at certain times.

"A few years ago the State Board of Health of Massachusetts studied the discharge of sewage into Boston Harbor and arrived at some conclusions of more or less general application. The discharge of sewage into frequented waters should be so made that the sewage will be quickly lost to the senses and even to chemical tests, which may be accomplished by discharging into quick currents of large volumes where the dispersion will be rapid and the dilution great. It was found that the sewage being of less density than the sea water tended to float, spreading out with but slight depth. At a surface outlet the sewage mingled with the sea water in a small area so as to be detected at depths of 4 or 5 feet, but over a much larger area the depth at which it could be plainly detected was only about 2 feet beyond which the depth diminished gradually towards the borders of the area affected, where the sewage formed merely a surface film which gave to the water an oily appearance. Analysis of samples taken from the area covered by the film and from the discolored area showed that the portion of the sewage tract which contained a considerable amount of organic matter was substantially identical with the area of discoloration, and that the amount of organic matter in the film is so minute as not to be a source
136 of offense. The discoloration on a comparatively calm day, was objectionable to the sight over only about two-thirds of the area, and the offensive odors were confined to a relatively small portion.

"If the sewage is discharged below the surface the tendency of the light particles to rise will cause a more rapid dispersion and disappearance of color than when discharged at the surface. The deeper

the submergence of the outlet, the more thorough is the dispersion. Where, in addition, a strong current prevails comparatively large quantities of sewage could be thus discharged without even becoming noticeable at the surface of the water. One of the outlets in Boston Harbor is under about 10 feet of water at high tide, and another, which is being constructed, will be at a depth of more than 30 feet. The present temporary outlet of the Honolulu sewer system is in 30 feet of water and is to be extended into water 100 feet deep, because there are no suitable strong currents in the harbor. The proposed Passaic Valley trunk sewer, in New Jersey, is to discharge into New York Bay at a depth of 40 feet. Discharge under a considerable depth wherever feasible, seems to possess decided advantages."

137 *Letter of O. H. Tittman.*

Treasury Department.

Office of the Coast and Geodetic Survey.

E. C. H.

All communications should be forwarded under cover to the "Superintendent U. S. Coast and Geodetic Survey, Washington, D. C."

WASHINGTON, June 1, 1903.

Mr. J. A. Lebkuecher, Chairman, Passaic Valley Sewerage Commission, Prudential Building, Newark, N. J.

SIR: I have the honor to transmit additional data of the discharge through New York Harbor, from computations made a year later than the ones previously transmitted.

Epitome of Results for Discharge.

June 25, 1886.

	Cubic feet.
East River ebb (westerly) 19th street	4,454,937,257
Flood (easterly)	4,007,175,676
Hudson River ebb (southerly) 39th street	6,996,678,413
Flood (northerly)	6,225,985,545
Kill von Kull ebb (toward the Harbor)	1,790,103,372
Flood (W. New Brighton)	1,712,415,362
Narrows, ebb (seaward)	13,819,895,144
Flood	12,703,616,481

The volumes of discharge given above should supercede the data previously furnished.

Very respectfully,

O. H. TITTMAN,
Superintendent, W. M. P.

NOTE.—The reports of William Barclay Parsons, consulting engineer, and Allen N. Spooner, C. E., were received too late to be submitted to the Governor with the report of the Commissioners.

(Here follows map marked page 137½.)

138 Supreme Court of the United States, October Term, 1908. No. 9. Original. Between the People of the State of New York, Complainant, and The State of New Jersey and Passaic Valley Sewerage Commissioners, Defendants. Answer. Edmund Wilson, Attorney General, Attorney for the State of New Jersey. Robert H. McCarter, of Counsel. Joseph Coult and Chandler W. Riker, Attorneys for Passaic Valley Sewerage Commissioners.

139 Supreme Court, U. S., October Term, 1908. Term No. 9. Original. The People of the State of New York, Complainant, vs. The State of New Jersey, et al. Answer of Defendants. Filed January 4th, 1909.

140 And afterwards to wit, on the 11th day of January, A. D. 1909, the following entry appears of record, viz:

9, Original.

PEOPLE OF THE STATE OF NEW YORK, Complainant,
vs.
THE STATE OF NEW JERSEY et al.

On motion of Mr. Solicitor General Hoyt, leave is hereby granted him to file a brief in reply to the brief of the defendants filed herein in opposition to the petition of the United States for leave to intervene in this cause.

January 11, 1909.

141 And afterwards, towit, on the 25th day of January, A. D. 1909, the following entry appears of record, viz:

9, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainant,
vs.
STATE OF NEW JERSEY et al.

On consideration of the motion on behalf of the United States for leave to intervene in this cause, It is now here ordered by the Court that said motion be, and the same is hereby, granted, without prejudice.

January 25, 1909.

And on the same day, to wit, on the 25th day of January A. D. 1909, the petition of the United States was filed in words and figures following, viz:

142 In the Supreme Court of the United States, October Term, 1908.

In Equity. No. 9, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
v.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants; THE UNITED STATES, Intervenor.

Petition of Intervention on Behalf of the United States.

To the Honorable the Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

Comes now the United States of America by Charles J. Bonaparte, Attorney-General, and by leave of the court first had and obtained, files this its petition of intervention in the above-entitled cause. And thereupon your petitioner humbly prays as follows:

1. On October 13, 1908, on the motion of the Attorney-General of the State of New York the permission of this Honorable Court was granted said Attorney-General of said State of New York to file an original bill of complaint in equity in behalf of "The
143 People of the State of New York" against the "State of New Jersey and Passaic Valley Sewerage Commissioners" setting out in substance the subject-matter of this petition for intervention as relating to and affecting the interests of the People of the State of New York, describing the sewerage project hereinafter described and praying that the defendants, the State of New Jersey and the Passaic Valley Sewerage Commissioners, make answer to the matters in said bill of complaint in equity there stated and charged; and that said defendants be required to show cause, if they can, why the defendants aforesaid, their officers, agents, servants and employees, and all other persons acting or pretending to act by or under the authority of the State of New Jersey or of the Passaic Valley Sewerage Commissioners, be enjoined and restrained by writ of injunction from constructing or causing or permitting to be constructed the sewer and sewage plant hereinafter described in this petition, or any part thereof, or any other sewer, sewage plant, or works substantially similar thereto in design or in effect, or designed or intended to conduct into the waters of upper New York Bay and Harbor the sewage or drainage of the Passaic Valley sewerage district or of any part thereof; and from receiving into any sewer, sewage plant or works with a view to or for the purpose of discharging any part thereof into the waters or bays and harbors aforesaid, and from discharging or procuring or suffering to be discharged into said waters the sewage or drainage of the said district or of any part thereof, and from otherwise
144 defiling or polluting the said waters, or procuring them to be defiled or polluted by the discharge of said sewage therein. That said original suit instituted as aforesaid is now pending on

the docket of this Honorable Court as Original, No. 9, and that this court has required said defendants to make answer to the said complaint filed therein.

2. That the port and harbor of New York mentioned and described in the complainant's bill of complaint is one of the important ports and one of the great harbors of the country, and a center of commerce, and of the utmost importance to navigation; many foreign and other steamship lines bringing and carrying unlimited numbers of passengers; its exports, imports, traffic, and trade, foreign and coast-wise, being of the greatest volume and magnitude. That the United States has expended and is expending enormous sums of money in improvements in and about said harbor, and in dredging channels and for other necessary purposes as hereinafter more fully set out, all in the interest of general commerce and for the benefit of navigation and the general welfare of the country. That in and about the said harbor of New York the United States has erected, and is erecting at vast expense, important and necessary structures, and is the owner of a very large amount of public property, including forts, immigrant stations, barracks, dwellings, and other buildings required by and suited to the requirements of the General Government as hereinafter also more fully set forth; that said forts, stations, structures,
145 and buildings are constantly occupied by many officers, soldiers, sailors, and employees of the United States and their families, under the control and dependent in a large measure upon the United States Government for sanitary protection in the interest of health and other necessaries and conveniences; that it is the theory of our laws and the decisions of the courts that the quarantine and health laws of the State of New York which apply to the said harbor and said navigable waters of New York are also recognized and adopted as the quarantine laws of the United States as applicable to such harbors in the interest of commerce in general and the consequent public welfare of the nation.

3. The plaintiff in said suit "The People of the State of New York" is the legal title of a State of the Union, to wit, the State of New York. The defendant, the State of New Jersey, is one of the States of the Union, and by its legislature in the year 1902 enacted a law constituting chapter 48 of the laws of New Jersey of 1902, approved March 27, 1902, entitled, "An act to create a sewerage district to be called Passaic Valley Sewerage District," a copy of said act being annexed hereto marked "Exhibit A" and made a part of this petition. And thereafter the legislature of the State of New Jersey enacted a law constituting chapter 10 of the laws of New Jersey of 1907, approved March 18, 1907, entitled, "An act to provide for the purification of the waters of the Passaic River within the Passaic Valley sewerage district, prohibiting the discharge of sewage or other polluted matter into said portion
146 of said river after a fixed date, and authorizing municipalities lying in whole or in part within the Passaic Valley sewerage district, from the territory of which sewage or other polluting matter is or may be discharged into said portion of said

river, to enter into contracts with each other and with the Passaic Valley Sewerage Commissioners for the intercepting and disposal of such sewage and other polluting matter, and to provide the necessary funds therefor," a copy of said act being annexed hereto, marked "Exhibit B" and made a part of this petition.

4. The defendants, the Passaic Valley Sewerage Commissioners, acting as a governmental agency of the defendant, the State of New Jersey, and by virtue and in execution of the authority conferred upon them by that State in and under its supervision, control, and approval, pursuant to the provisions of said chapter 48 of the laws of New Jersey of 1902 and of said chapter 10 of the laws of New Jersey of 1907, have prepared and adopted maps, plans, specifications, and estimate of cost for the construction of a joint trunk or main intercepting sewer, and other plants and works for collecting and discharging the sewage of the Passaic Valley sewerage district referred to in the said laws and additional territory, comprising altogether the natural drainage area of the Passaic River of the State of New Jersey; and that on April 20, 1908, the said commissioners adopted a plan in substance as follows: The main district sewer to begin in Paterson in the State of New Jersey, at Prospect street, a short distance below the Great Falls, thence
147 continuing in general down along the west bank of the Passaic River until it reaches the city of Newark, where it will cross the Newark Meadows to the shore of Newark Bay, where it is proposed to pass the sewage through a grit chamber intended to remove gravel, sand, and other heavy matter, and through a screen chamber intended to remove floating matter, thence entering a pumping station where the sewage will be raised to an elevation of about 15 feet above mean high water for the purpose of giving it head, and thence to continue through a tunnel constructed under Newark Bay, Bayonne, and Jersey City, in the State of New Jersey, and through the soil underlying the waters of New York Bay to a point of discharge in the bay about half a mile north of Robbins Reef Light on the westerly edge of the main ship channel, where it is intended to discharge the said sewage into the waters of the bay from the outlet of the said sewer, which is intended to consist of four parallel pipes with a number of smaller openings to afford more ready dispersion in the currents of the channel. The said plan shows that the area of the Passaic Valley sewerage district, as constituted by the said chapter 48 of the laws of New Jersey of 1902, is 76.62 square miles, and that the proposed addition to the said district is 26.61 square miles, making a combined area included in the plan of the said commissioners of 103.23 square miles. The population of the municipalities whose territory the proposed sewer is intended to drain was, in the year 1905, as ascertained by the Federal
148 census, 601,817 persons, and the said commissioners estimate the fact will be, that by the year 1911, when it is proposed to have the sewer ready for operation, the population of the said territory will be upward of 700,000 persons, and by the year 1940 will be upward of 1,640,000. The average amount of sewage flow

per twenty-four hours for the said natural drainage area of the Passaic River in the year 1905 is ascertained by the said commissioners to have been 89,343,000 gallons, and by the year 1940, the maximum amount of sewage flow per twenty-four hours, based on the estimated population of 1,640,000, is estimated by the said commissioners at upwards of 357,365,000 gallons.

5. The said Passaic Valley Sewerage Commissioners threaten and intend to build the said proposed sewer, substantially as hereinbefore stated, and intend to gather into it the sewage of the sewerage district aforesaid, and to discharge the same into the waters of New York Bay, and up to the present time fourteen of the thirty municipalities within the said natural drainage area of the Passaic River have consented to and approved the said project of the commissioners and have agreed to adopt and use the said proposed sewer for the drainage of their respective localities, and that the amount of sewage which the said district will furnish to the said sewer at the outset is upward of 120,000,000 gallons per twenty-four hours; that while the plans of the commissioners state that grit and screen chambers will be built on the Newark Meadows to remove gravel, sand, and other heavy matter, the com-
149 missioners themselves have admitted that no definite plans or specifications have been adopted for the construction of the said grit and screen chambers; that the said plans are wholly indefinite, and that no statement is made by the said commissioners of the amount of solid matter which they propose to remove from the sewage of the said joint trunk or intercepting sewer, other than that under the most favorable circumstances they can remove only from 15 per cent. to 25 per cent. of solid matter in suspension, and your petitioner shows that approximately 60 per cent. of the total solids of the sewage of the average American city is in solution, leaving 40 per cent. in suspension, and that if the commissioners remove at the outside 25 per cent. of the solids in suspension that would still leave 90 per cent. of the entire solids in the sewage to be discharged into the waters of New York Bay, to the great detriment and injury of navigation and commerce and to the great injury of property of the United States, as hereinafter more fully set out.

6. New York Bay, referring to the upper New York Bay, lies south of Manhattan Island, in the city of New York, and to the west of the Borough of Brooklyn, in the County of Queens, also in the city of New York, and north of Staten Island, in the Borough of Richmond, also in the city of New York, and to the west of that part of the State of New Jersey comprising principally Bayonne and Jersey City; that the upper New York Bay is a navigable body of water in which there is a great volume of commerce and
150 wherein the tide ebbs and flows, and that the chief trend of the currents is from the Hudson and East rivers on the north and the Kill Van Kull on the west through the said upper bay and passing out at the southerly end through the Narrows into the lower New York Bay.

7. The tides oscillate between the upper New York Bay and the

lower New York Bay, also a navigable body of water, through the Narrows, the volume of the ebb tide of the upper New York Bay through the Narrows being somewhat greater than the volume of the flood tide through the Narrows owing to the waters of the Hudson River, East River and Kill Van Kull entering the upper New York Bay on the north and west sides. The volume of the ebb tide at the Narrows, as ascertained in the report of the United States Coast and Geodetic Survey for 1886, on June 25, 1886, was 13,819,895,144 cubic feet, and the volume of the flood tide at the same place, as ascertained from the same report on the same day was 12,703,616,481 cubic feet, making an excess of ebb tide over the flood through the Narrows of only 1,116,278,663 cubic feet.

8. While there is an excess of ebb over flood tide through the Narrows, as aforesaid, yet all the water which enters the upper New York Bay through the Hudson River, East River, and Kill Van Kull does not immediately pass through the Narrows, but is mixed with the water of the upper New York Bay by the currents—including a strong underrun moving upstream—and retained therein several days before passing through the Narrows on
151 the ebb tide, and a large part returning through the Narrows on the flood tide until gradually forced—while oscillating as aforesaid—far enough out to sea to withstand the pressure of the flood tide; that the peculiar formation of the lower New York Bay, the Narrows, and the upper New York Bay are such as to prevent the ready assimilation of the sewage entering the upper New York Bay with the unpolluted water of the ocean, but that the tendency of the waters entering the upper New York Bay are to thus oscillate through the Narrows between the upper and lower New York bays for many days before finally settling, being assimilated, or reaching the ocean, during all of which time sedimentation to a certain extent is taking place.

9. The waters of New York Bay are at the present time already badly polluted owing to the sewage discharges of New York City, Hoboken, Jersey City, Bayonne, Brooklyn, and in fact nearly all the cities along the banks of the said upper New York Bay and along the banks of the East River and Hudson River to its very sources, following old and unscientific methods of sewage disposal, and that any further contamination from the sewage proposed to be discharged from the Passaic Valley sewer will render conditions more intolerable and tend to prevent the ready assimilation of the sewage already entering the said waters, and the contemplated improvement of said existing sewerage conditions, to the detriment and injury of navigation and commerce, and to the injury of property of the United States, as hereinafter set
152 out.

10. The defendants, the Passaic Valley Sewerage Commissioners, propose and threaten to discharge the sewage of the natural drainage area of the Passaic River into the middle of the upper New York Bay, as aforesaid, and have failed to provide any definite plans for the removal of solid matter which the said sew-

age will contain, which will amount to thousands of tons every year, and that the said solid matter will settle and tend to shoal the channels of both the upper and lower New York bays and the Narrows, which have been dredged and constructed at enormous expense by the United States Government, as hereinafter shown, and will obstruct navigation and materially injure the navigable capacity of the aforesaid navigable waters, and will tend to fill and to alter and modify the course, location, condition, and capacity of the said upper and lower New York Bays and the Narrows including the port and harbor of New York. The solid matter in suspension unless entirely removed before entering the waters of the upper New York Bay, together with the detritus, will quickly settle along the shores and bottom of the upper New York Bay, where it will be washed by the currents into the docks and channels, and a large part gradually working out through the Narrows into the lower bay and the channels therein, to be removed at a great expense on the part of the United States. The other solid matters in suspension in said sewage will also be borne by the currents throughout the upper bay, and to a
153 certain extent reach and settle in the channels and flats of the lower New York Bay. That the solids in solution will tend to settle and precipitate, owing to the chemical and bacteriological actions, but will to a degree reach the bottom of the said bay and shoal the channels aforesaid, to the detriment and injury of navigation and commerce.

11. The effluent discharge from the dispersion area of the sewer will be of a higher temperature than that of the water of the bay in its immediate vicinity, and will, therefore, tend to rise and spread out over the surface, making a polluted, evil smelling, foul, and unsightly surface, rendering life uncomfortable and unpleasant to those living in its near vicinity or passing over it while engaged in commerce, and will be generally unhealthy and constitute a nuisance, to the detriment and injury of commerce and navigation.

12. The defendants, the Passaic Valley Sewerage Commissioners, propose to construct and maintain near the outlet and within a short distance of Robbins Reef Light, in the navigable waters of the upper New York Bay and Harbor, a permanent shaft and shaft house, not exceeding 100 feet square and not exceeding 20 feet in height above high water; and that the said defendants propose to construct a number of dispersion pipes at least 40 feet below mean low water and on the bottom of the main ship channel of the upper New York Bay and Harbor, and that the plans and specifications for the construction, position, size, and maintenance of the said pipes of the dispersion area and of the said shaft house
154 are indefinite, but as shown and as far as can be determined from the published report of the said Passaic Valley Sewerage Commissioners adopted April 20, 1908, will obstruct navigation and tend to alter the channels in the said upper New York Bay and will diminish the navigable capacity of the said waters, to the great detriment and injury of commerce, as aforesaid.

13. The channels in the upper and lower bays of New York, your petitioner is informed and believes, are, as ascertained from the Annual Report of the Chief of Engineers of the War Department, substantially as follows: Gedney Channel, lying outside of the lower bay toward the ocean, being northeast of Sandy Hook and between Sandy Hook and Rockaway, was the principal ship channel for large vessels entering the lower bay, prior to the construction of the recently completed Ambrose Channel; that the project for the improvement of the Gedney Channel was approved by the Secretary of War December, 1884, and extended to cover the whole of the main entrance to the harbor during 1886. It provided for dredging a channel 1,000 feet wide and 30 feet deep at mean low water, from deep water below the Narrows through main ship and Gedney channels to deep water outside the bar. The estimated cost was $1,490,000 for dredging 4,300,000 cubic yards. The actual amount dredged to October, 1891, when the work was approximately completed, was 4,875,079 cubic yards. The existing project for maintenance of the channels was approved
155 March 15, 1892, and the average expense has amounted to about $80,000 annually. Under these projects, the amount expended up to June 30, 1890, is upward of $2,146,000, with the result that channels to the sea have been obtained with a depth of 30 feet at mean low water and width of 1,000 feet or over, and have been maintained for the full depth with, as nearly as possible, the full width. During the fiscal year ending June 30, 1908, 351,139 cubic yards of mud and sand were removed from the west side of the main ship channel, deepening the shoals which formed along the channel's edge. In this channel, the tide currents run across the course of the channel and wash in and already deposit a large amount of silt which will be added to by said proposed discharge of said sewage.

14. Ambrose Channel, formerly known as East Channel, was authorized by the river and harbor act of 1899, and adopted for making an entrance to New York Harbor to be 2,000 feet wide and 40 feet deep at mean low water, involving an excavation of about 42,500,000 cubic yards of material for a length of 7 miles of channel, not to exceed a cost of $4,000,000, later increased to $5,158,510. The original available depth through this channel was 16 feet at mean low water, used only by two boats, scows, and other light-draft vessels. Up to July 1, 1908, $3,360,376 had been expended under this project and 32,124,442 cubic yards of sand, mud, and stone and other sediment were removed. Ambrose Channel was buoyed for navigation in September, 1907, and restricted
to daylight navigation by ships of 29 feet draft or over or
156 of 600 feet length or over—ships whose depth or length were not sufficiently accommodated by the old channel. It has since been used regularly by ships of the permitted size, but its navigable capacity will in a measure be injuriously affected also by the discharge of said sewage and sedimentation and shoaling as a result thereof.

15. Bay Ridge and Red Hook channels in the upper New York

Bay lie along the east shore, and with Buttermilk Channel form an easterly channel between the Narrows and East River, separated from the main channel in upper New York Bay by a broad shoal off Gowanus Bay and Governors Island. The Bay Ridge and Red Hook channels were completed in 1899 at a cost of about $1,090,000. There is an existing project for making Bay Ridge and Red Hook channels 40 feet deep at mean low water, and 20 feet wide, authorized by the river and harbor act of 1899, at a cost not exceeding $2,500,000. Under this project up to June 30, 1908, $1,436,666 had been expended, and 13,649,389 cubic yards of material had been dredged. The total length of the channel covered by the improvement is four and a quarter miles. The sewage discharge from said proposed sewer and the sedimentation and shoaling resulting therefrom will tend to injure and impair the work on and navigable capacity of said channel.

16. In the vicinity of said proposed point of discharge of said sewer, to wit, from Fort Wood—otherwise known as Bedloe
157 Island—upon which island is situated also the "Statue of Liberty," and on the same side of the upper New York Bay as said proposed point of said sewer discharge, the United States Government is engaged in dredging a new channel to connect with a channel now in use for the purpose of navigation and commerce, also on the same side of said upper New York Bay, known as Black Tom Channel. That the total appropriation by Congress up to the present date for this new channel has been $68,610.00. The said sewer discharge at a point proposed and provided in the plans of the said Passaic Valley Sewerage Commissioners will cause shoaling and by sedimentation will tend to fill up this channel, being constructed as aforesaid, to the injury and obstruction of commerce and navigation and in the navigable waters aforesaid, and further tend to impair and reduce the navigable capacity of said waters. From time to time the Government will be compelled to dredge other similar additional channels in said upper bay and harbor and also in said lower bay and harbor, to improve navigation, in aid of the growing commerce of the port of New York. This discharge of said sewage matter, to continue in effect for all time to come and increase in volume with increase of population even at the present ratio, will tend to obstruct the future making of such additional channels and such efforts to thus continue the improvement of the navigable capacity of said bays and harbors aforesaid.

158 17. The improvement and maintenance of these channels are imperative to permit the entrance of modern vessels into the port of New York. The effect of these improvements is undoubtedly to lower freight rates in the interest of commerce, these rates depending largely upon the volume of business and ability to handle it in large bulk with the availability of dockage facilities. The maximum draft of ships leaving the harbor in 1907 was 34 feet 8 inches, and the maximum draft of ships entering the harbor was 32 feet and 10 inches; and the total number of different ships of 27 feet draft or over in 1907 was over 152. Be-

fore the improvement of the entrance to the harbor, vessels drawing 27 feet only could cross the bar at extreme high tide only.

18. The construction and operation of the proposed Passaic Valley sewer will discharge large quantities of solid matter, the volume of which is not easily computed, into the waters of New York Harbor, which will oscillate through the Narrows and through the channels of both upper and lower New York Bays, and will tend to shoal and obstruct navigation generally in those waters and reduce the navigable capacity and alter, modify, and change the channels and necessitate the expenditure of further sums of money by the Government of the United States in maintaining those or other channels, and will necessitate the maintenance of dredges, scows, and boats to remove said deposits of solid matter,
159 and said dredges, scows, and boats in themselves will obstruct navigation and impede commerce.

19. The number of American and foreign vessels, sail and steam, engaged alone in the foreign trade of the United States, which entered the port of New York during the fiscal year ending June 30, 1907, was 4,229 and their tonnage 11,383,345, as compared with the total number entering all ports of the United States during the same period of 26,158 in number and 36,622,256 in tonnage. The number of foreign and American vessels, sail and steam, engaged alone in the foreign trade of the United States which cleared from the port of New York during the fiscal year ending June 30, 1907, was 3,764 and their tonnage 10,472,601, as compared with the total number of vessels clearing from all ports of the United States of 34,148 in number and with a tonnage of 35,990,057.

20. For the year ending June 30, 1907, the imports into the United States at the port of New York aggregated about 5,145,000 tons, valued at $914,918,529. The value of such imports for all other ports of the United States for the same period was $676,959,716. During the same year the exports from the port of New York amounted to about 7,172,000 tons, valued at $698,191,855. The value of such exports for all other ports of the United States for the same period was $1,290,797,472.

21. The threatened and intended acts of the defendant, herein set forth, will, if not restrained, tend, as your petitioner is informed
and believes, to make the port of New York less serviceable
160 and less attractive to commerce by virtue, among other things, of the offensive and unpleasant odor and the unsightly appearance of the water and of the channels, wharves, and docks, which will result from the discharge of the sewage in the manner aforesaid into the waters of the bay, and by reason of the injurious action of the sewage so discharged will injuriously affect the hulls of vessels and their paint, both exterior and interior, including war ships and other craft belonging to the United States Government, and in many ways will injuriously affect commerce and navigation in the port of New York.

22. That ships or marine craft of any description engaged in commerce in and upon the navigable waters aforesaid, which shall

be so unfortunate as to sink therein, will be greatly injured by the solids floating in suspension and solution through and around the hull of such ships or other craft.

23. The United States Government owns valuable and extensive property on the upper New York Bay and along the shores of the Narrows, including Governors Island, the Headquarters of the Department of the East, United States Army; Fort Wadsworth, Fort Tompkins, and Fort Hamilton; Ellis Island, where all steerage passengers from abroad are transferred from the steamers in which they arrive; Liberty Island—known also as Bedloe Island—on which is Fort Wood, where a United States army station is located, and on which stands the Bartholdi Statue of Liberty, presented by the French people to the United States; an anchor sta-
161 tion off Stapleton in said upper New York Bay for war ships; ferryboats owned and operated by the United States from the Battery to Ellis Island, and from the Battery to Bedloe Island and Fort Wood; also numerous boats which run to and from the various government stations, the Brooklyn Navy-Yard and Sandy Hook; also several lighthouses, and the Brooklyn Navy-Yard, the foremost naval station in the country, situated on the East River, with its docks and United States war ships under construction and repair; that the Government maintains many residences and barracks on said properties, and that the said persons thereon engaged in the government service will be seriously affected, and the health of the said residents materially injured, by the discharge of the effluent from the Passaic Valley sewer as proposed, which sewage will wash up on the shores of said property, and create an unpleasant and very offensive stench, and will create a nuisance and render life uncomfortable for persons living on the said government property or passing to and from said properties and over the bay of New York, especially near the dispersion area, while in the government service and otherwise, and will endanger public health and render the said properties and other property of the United States in the vicinity of said sewage discharge less valuable for the purposes for which they are now used and intended to be used hereafter.

24. The defendants, the Passaic Valley Sewerage Commissioners, also propose to maintain rafts, cribs, docks, floats, boats,
162 and other machinery during the course of the construction of the said sewer, which will in themselves for a long time obstruct navigation, and reduce the navigable capacity of the port and harbor of New York, and will obstruct navigation and injure commerce.

25. And your petitioner shows that the said threatened and intended acts of the defendants will be repeated and continued from day to day in perpetuity, to the manifest and irreparable injury of said property of the United States and to the health, safety, comfort, and welfare of its officers and men living and employed upon its property as aforesaid and passengers or persons traveling over the polluted area engaged in and constituting commerce as aforesaid, and reduce the navigable capacity of the waters of both

the upper and lower New York Bays and the Narrows as aforesaid, and will tend to shoal and obstruct and alter the channels, and will in general be contrary to public policy.

26. In the light of modern sanitary science and engineering methods, there are other, better, and more advanced methods for the disposal of the sewage heretofore described, and as proposed and planned as aforesaid by the said Passaic Valley Sewerage Commissioners; so that the method adopted and planned as aforesaid for such disposal to the manifest and continued injury of said described commerce and navigation, the public health of the port aforesaid, and the property of the United States is not necessary.

163 27. This petitioner therefore prays that it may be permitted to intervene in this case and court, and may be permitted to take proofs, examine witnesses, and be heard in argument; and also, that this petitioner shall have such other and further relief in the premises as shall be found agreeable in equity and good conscience.

CHARLES J. BONAPARTE,
Attorney-General.

HUGH GORDON MILLER,
Special Assistant to the Attorney-General.

164 APPENDIX.

EXHIBIT A.

Chapter 48, *Laws of* 1902.

An Act to Create a Sewerage District to be Called Passaic Valley Sewerage District.

Be it enacted by the Senate and General Assembly of the State of New Jersey:

1. All that portion of Essex, Passaic, Bergen and Hudson counties beginning in the center of Newark Bay where the boundary line between the cities of Newark and Elizabeth meets the boundary line between the Counties of Essex and Hudson; thence running westerly along the boundary line between the city of Newark and the city of Elizabeth, running up Bound Creek to the boundary line betwen the township of Clinton and the city of Newark; thence running westerly between the boundary line of the city of Newark and the township of Clinton to the intersection of Clinton Place and Hawthorne Avenue; thence running southerly still along said boundary line to the center of Nye Avenue; thence running westerly along said center of Nye Avenue to a point one hundred feet easterly from Hobson Street; thence running southerly parallel to Hobson Street and one hundred feet easterly therefrom to a point two hundred feet northerly of Bragaw Avenue; thence running northerly parallel with Bragaw Avenue, and two hundred feet

northerly therefrom, to a point half way between Hobson Street and Leslie Street; thence running southerly half way be-
165 tween said streets to center of Bragaw Avenue; thench running westerly along the center of Bragaw Avenue to a point half way between Wainwright Street and Schley Street; thence running northerly half way between said streets to a point three hundred feet northerly from Bragaw Avenue; thence running westerly parallel to Bragaw Avenue, and three hundred feet northerly therefrom, and in a westerly prolongation of said line, to a point half way wetween Schley Street and Fabyan Place; thence running northerly half way between Schley Street and Fabyan Place to the center of Nye Avenue; thence running westerly along the center of Nye Avenue to the boundary line between the city of Newark and the town of Irvington; thence running northerly along said boundary line between Newark and Irvington to a point one hundred feet south of Avon Avenue; thence running easterly parallel to Avon Avenue, and one hundred feet southerly therefrom, to a point half way between South Twentieth Street and South Nineteenth Street; thence running northerly half way between said streets to a point one hundred feet northerly of Woodland Avenue; thence running easterly parallel to Woodland Avenue and one hundred feet northerly therefrom, to a point half way between South Nineteenth and South Eighteenth Street; thence running northerly half way between said streets to a point one hundred feet southerly of Eighteenth Avenue; thence running easterly parallel with said Eighteenth Avenue, and one hundred feet southerly therefrom, to a point half way between Eighteenth Street and Seventeenth Street; thence running northerly half way between said streets to a point two hundred feet northerly from Eighteenth Avenue; thence running easterly parallel to Eighteenth Avenue, and two hundred
166 feet northerly therefrom, to a point one hundred feet easterly from Seventeenth Street; thence running northerly parallel to Seventeenth Street, and one hundred feet easterly therefrom, to a point two hundred feet southerly from Fifteenth Avenue, and two hundred feet southerly therefrom, to a point half way between Sixteenth Street and Fifteenth Street; thence running northerly half way between Sixteenth Street and Fifteenth Street to a point one hundred feet northerly from fourteenth Street; thence running easterly parallel with Fourteenth Avenue, and one hundred feet northerly therefrom, to a point half way between Fifteenth Street and Fourteenth Street; thence running northerly half way between said streets to a point three hundred feet northerly from Fourteenth Avenue; thence running easterly and parallel with Fourteenth Avenue, and three hundred feet northerly therefrom, to a point one hundred feet westerly from Ashland Avenue; thence running northerly parallel with Ashland Avenue, and one hundred feet westerly therefrom to the north side of South Orange Avenue; thence running westerly along said north side of South Orange Avenue to the east side of South Eighteenth Street; thence running northerly along said east side of South Eighteenth Street to a point in range of a line half way between Twelfth Avenue and

Thirteenth Avenue; thence running westerly half way between said avenue to a point half way between South Nineteenth and South Twentieth Street; thence running southerly half way between said streets to a point one hundred feet northerly from Thirteenth Avenue; thence running westerly parallel to Thirteenth Avenue, and one hundred feet northerly therefrom, to the boundary line between the city of Newark and the borough of Vailsburgh;
167 thence running northerly along said boundary line between the city of Newark and the borough of Vailsburgh to the boundary line between the city of East Orange and the borough of Vailsburgh; thence westerly along the boundary line between the city of East Orange and the borough of Vailsburgh to an angle therein; thence running southerly still along said boundary line to another angle in said line in South Orange Avenue; thence running westerly still along said boundary line and South Orange Avenue to a third angle; thence running northerly still along said boundary line to a fourth angle; thence running westerly still along said boundary line between the city of East Orange and the borough of Vailsburgh and the boundary line between the city of East Orange and the village of South Orange to a point in the boundary line between the city of Orange and the village of South Orange; thence running westerly along said boundary line between the city of Orange and the village of South Orange to the boundary line of the town of West Orange; thence running northerly along the boundary line between the town of West Orange and the city of Orange to the boundary line of the town of Montclair; thence westerly along the boundary line between the town of West Orange and the town of Montclair to an angle; thence running northerly further along said boundary line between West Orange and Montclair to the boundary line of the township of Verona; thence running northerly along the boundary line between Verona and Montclair to the boundary line of the township of Little Falls; thence running easterly along the boundary line between the township of Little Falls and the town of Montclair to the boundary line of the township of Acquackanonck; thence running northerly
168 along the boundary line between the township of Little Falls and Acquackanonck Township to the southerly boundary of the city of Paterson; thence northwesterly along the same to a point in the Passaic River where the said southerly boundary line of the city of Paterson would intersect the dividing line between the city of Paterson and Totowa Borough; thence northwesterly along said dividing line to the northwesterly boundary line of the city of Paterson; thence following the various courses of the northerly boundary line of the city of Paterson to the center of the Passaic River; thence along the center of said river to the northerly boundary line of the borough of Garfield; thence easterly and southerly along the several courses of the boundary line of the borough of Garfield to a point where said boundary line is intercepted by the northeasterly corner of the boundary line of the borough of Wallington; thence southerly along the easterly boundary line of the borough of Wallington to Hoboken Street on the bound-

ary line between the borough of Wallington and East Rutheford; thence southeasterly along said line to a point where Hoboken Street is intersected by Montross Avenue; thence southwesterly along the center of Montross Avenue to the boundary line between the boroughs of East Rutheford and Rutheford; thence southwesterly along the center of Montross Avenue to the center of Washington Avenue; thence northwesterly along the center of Washington Avenue to Prospect Place; thence southwesterly along the center of Prospect Place to Union Avenue; thence southwesterly in prolongation of the line of the center of Prospect Place and parallel to Carmita Avenue to a point where said line would be intersected by the center line of Fairview Avenue if prolonged northwesterly;
169 thence southeasterly to the southeasterly side of Montross Avenue; thence southeasterly along the center of Fairview Avenue three hundred and fifty feet; thence southwesterly parallel to the center line of Montross Avenue to the center line of Passaic Avenue; thence southerly in a straight line to a point two hundred and fifty feet westerly from Montimer Avenue midway between Donaldson and Woodland avenues; thence southeasterly parallel to Donaldson Avenue to the center of Mortimer Avenue; thence southerly along the center of Mortimer Avenue to the center of Park Place; thence easterly along the center of Park Place to the intersection of Park Place and Wheaton Place, thence southwesterly along the center of Wheaton Avenue to the center line of Pierrepont Avenue; thence southerly along the center of Pierrepont Avenue to its intersection with the center line of Ridge Avenue; thence southwesterly along said Ridge Avenue to the center line of Woodland Avenue; thence southeasterly along the center of Woodland Avenue to the center line of Sylvan Street; thence southwesterly along the center of Sylvan Street to the center line of Van Riper Avenue; thence southerly in a straight line to the intersection of the center lines of Summit and Rutheford avenues in the boundary line between the borough of Rutheford and the township of Union; thence southwesterly in a straight line to the intersection of the center line of Cromwell and Kingsland avenues; thence southwesterly along the said line of Cromwell Avenue to Jauncey Avenue in the borough of North Arlington; thence still southwesterly along the center of Cromwell Avenue to a point one hundred feet northerly of the Jersey City and Belleville Turnpike; thence running southeasterly parallel with said turnpike and one hundred feet northeasterly therefrom, to a point measuring south-
170 easterly along said line five thousand feet southeasterly from its intersection with the center line of the New York and Greenwood Lake Railroad; thence running southerly to a point in the Newark plank road, which point is one thousand eight hundred and fifty feet measuring easterly along said plank road from the center of the draw on said road over the Passaic River; thence running southerly to a point on the Newark and New York Railroad, which point is one thousand eight hundred and fifty feet, measuring easterly along said railroad, from the center of the draw over the Passaic River on said railroad; thence running southerly in a

prolongation of said last described course to its intersection with the easterly boundary of the city of Newark in Newark Bay; thence running southerly along said boundary of the city of Newark to the point of the beginning, shall be and is hereby constituted sewerage district under the name and title of Passaic Valley Sewerage District, and it shall be entitled to all the authority and shall be subject to all the laws of this State concerning sewerage districts so created.

2. This act shall take effect immediately.

Approved March 27, 1902.

171 EXHIBIT B.

Chapter 10, *Laws of* 1907.

An Act to provide for the purification of the waters of the Passaic River within the Passaic Valley Sewerage District, prohibiting the discharge of sewage or other polluting matter into said portion of said river after a fixed date, and authorizing municipalities lying in whole or in part within the Passaic Valley Sewerage District, from the territory of which sewage or other polluting matter is or may be discharged into said portion of said river, to enter into contracts with each other and with the Passaic Valley Sewerage Commissioners for the intercepting and disposal of such sewage and other polluting matter, and to provide the necessary funds therefor.

Whereas, a large number of municipalities and the inhabitants thereof are now discharging sewage and other polluting matter into the waters of the Passaic River within the Passaic Valley Sewerage District, between the Great Falls at the city of Paterson and the mouth of the Passaic River at Newark Bay and said waters are thereby polluted; and

Whereas, in order to purify said portion of said river, it is necessary that power be granted to said municipalities to adopt some method to prevent the discharge of sewage and other polluting matter into said portion of said river by mutual co-operation, and that a reasonable time be granted within which to provide the necessary means for intercepting and disposing of said sewage and other polluting matter:

Be it enacted by the Senate and General Assembly of the State of New Jersey:

1. Every municipality, corporation and individual is hereby prohibited and forbidden to discharge, directly or indirectly, any
172 sewage or other polluting matter into the waters of the Passaic River at any point between the Great Falls in the city of Paterson and the mouth of the said river at Newark Bay, or into any tributaries of the Passaic River which empty into the Passaic River between said points, after the twelfth day of December, in the

year one thousand nine hundred and twelve; and the Passaic Valley Sewerage Commissioners are hereby authorized and empowered to enforce the provisions of this act over and throughout all municipalities which may, or the inhabitants of which may, directly or indirectly, discharge sewage or other polluting matter into the waters of the Passaic River between the points above designated, or into the tributaries aforesaid, after the said twelfth day of December, one thousand nine hundred and twelve.

The Passaic Valley Sewerage Commissioners are hereby authorized and directed within thirty days after the approval of this act, to notify each municipality from which sewage other polluting matter is or may be discharged into the said river between said points, either directly or indirectly, and the inhabitants thereof, that the discharge of sewage and other polluting matter into the waters of the said river must be discontinued on or before the twelfth day of December, in the year one thousand nine hundred and twelve. Such notice shall be in writing, signed by the president and secretary of the Passaic Valley Sewerage Commissioners, and shall be served upon the clerk or the equivalent officer of every such municipality, and shall be published in one of the newspapers printed and circulated in the counties of Passaic, Bergen, Hudson
173 and Essex, for two consecutive weeks, once in each week, such public notice to be in the following form:

To whom it may concern:

Public notice is hereby given that the discharge of sewage and other polluting matter into the waters of the Passaic River at any point between the Great Falls, at the city of Paterson, and Newark Bay, and into the tributaries of the said river emptying therein between said points, is prohibited and must cease and be discontinued after December twelfth, in the year one thousand nine hundred and twelve.

The Passaic Valley Sewerage Commissioners are further authorized and empowered to institute in their corporate name suits at law or in equity, as may be deemed necessary or appropriate to enforce the provisions of this section of the act after said twelfth day of December, in the year one thousand nine hundred and twelve; and the court of chancery of this State is hereby vested with special jurisdiction to enforce the provisions of this section of this act in a summary manner upon application of the Passaic Valley Sewerage Commissioners.

2. The governing body or board having charge of finances of any municipality or municipalities, lying in whole or in part within the Passaic Valley Sewerage District may, by resolution, determine that it is advisable and to the interest of such municipality or municipalities, in order to comply with the provisions of this act, to cause the sewage and other polluting matter discharging or which may be discharged into the waters of the Passaic River, from its or their territory, within the Passaic Valley Sewerage District, to be intercepted by a trunk or main intercepting sewer or sewers, and to be

conducted to a safe and proper place for discharge and dis-
174 posal, and there to be discharged and disposed of; and may further, by said resolution, request the Passaic Valley Sewerage Commissioners to prepare and submit maps, plans and specifications, for the construction of a joint trunk or main intercepting sewer or sewers, and of the necessary works for the discharge and disposal of sewage and other polluting matter, at some safe and proper place or places, together with an estimate of the probable cost of such construction and of the operation and maintenance thereof, and of obtaining the necessary property rights for the construction thereof, and also an estimate of the sewage capacity in said trunk sewer or sewers, required by each municipality lying in whole or in part within said sewerage district. Also, an estimate of the proportion of said cost of construction, as near as may be, which would be apportioned to each of said municipalities, upon the basis expressed in section four of this act. The municipality making such request shall, in and by said resolution, agree to pay the said Passaic Valley Sewerage Commissioners the cost, not exceeding ten thousand dollars ($10,000), of preparing such maps, plans, specifications and estimates so requested.

And such municipality shall, at the time of making such request, pay as part of said expenses the sum of five thousand dollars ($5,000) to the Passaic Valley Sewerage Commissioners, which said moneys the said municipality is authorized to appropriate and pay from any fund or balance not otherwise appropriated; and it is also further authorized to raise by temporary loans, notes or bonds, said sums so to be advanced and paid by said municipality,
175 which shall be repaid to it, with interest at the rate of five per centum per annum, when contract, as hereinafter provided, shall have been entered into for the building of said sewer, sewers, plant or works.

3. Upon receiving a copy of such resolution or resolutions, authenticated by the clerk or other like officer of any one or more of such municipalities, the Passaic Valley Sewerage Commissioners shall forthwith prepare the said maps, plans and specifications and estimates, so requested, and copies thereof shall be delivered by the clerk of the Passaic Valley Sewerage Commissioners, to each of the clerks or other like officers of all the municipalities lying in whole or in part within the Passaic Valley Sewerage District.

An accurate record of the time and manner of the delivering of said copies by the clerk of the Passaic Valley Sewerage Commissioners to the clerks of said municipalities shall be made by the clerk of the Passaic Valley Sewerage Commissioners, and entered upon the minutes of said boards, and a like record shall be kept by the clerks of the said municipalities and shall be entered upon the minutes of the boards or bodies having charge of the finances in said municipalities respectively.

In preparing the maps, plans and specifications for the intercepting sewer or sewers, plant or works, to be made by the said commissioners as herein provided, and in making the estimate of the sewage capacity required for each municipality, regard shall be had

by the said commissioners both to the area and population to be provided for, making provision, however, for not more than ten per centum of the factory waste and excluding all waste from gas works, and all substances or discharges which may injuri-
176 ously affect the intergrity of the sewer or sewers when constructed.

4. Any two or more of said municipalities, at any time after the expiration of three months from the date of the said delivery of copies of said maps, plans, specifications and estimates to all of the said municipalities lying in whole or in part within the said sewerage district, are hereby authorized and empowered, by resolution of their governing bodies or boards having charge of their finances, to enter into a contract in writing with each other and with the Passaic Valley Sewerage Commissioners, in their corporate capacities, for the construction, maintenance and operation of said sewer or sewers, plant or works, with the appurtenances, or of so much thereof as may be necessary and appropriate for the contracting municipalities, together with works, machinery, appliances and other things requisite or useful for the purposes to be accomplished by such intercepting sewer or sewers, and for the purchase of lands, rights in lands and other property requisite or useful therefor.

The contract herein authorized shall generally describe the route, line, size and capacity of such intercepting sewer or sewers, and shall fix the percentage of the capacity therein, to the use of which each of the contracting municipalities shall be entitled, together with the percentage of the cost and expense of construction, repair, maintenance and operation of the same to be paid by each of the contracting municipalities. The cost of the construction of said sewer or sewers, plant and works shall in said contract be apportioned to the respective municipalities entering into the contract in such pro-
portion as the taxable property, real and personal, within
177 so much of said municipality so contracting as is embraced in said sewerage district, bears to the total amount of taxable property, real and personal, within so much of all the municipalities so contracting as is embraced within said sewerage district, as returned and certified by the respective taxing boards and taxing officers of the said municipalities for the year one thousand nine hundred and seven.

Provided, however, That all taxable property, real and personal, for this purpose, be assessed at its true value, and it shall be the duty of each assessor, taxing board and taxing officer, for the several municipalities so contracting, for this purpose to examine, compute and determine, and certify to the said sewerage board on or before the first day of October, one thousand nine hundred and seven, the amount of taxable property, real and personal, assessed for the year one thousand nine hundred and seven, to and upon persons and property within so much of the several municipalities so contracting as lie within the said sewerage district; and the books of each of said assessors, taxing boards and taxing officers shall at all times be open for examination to the Board of Sewerage Commissioners and to the contracting municipalities, its and their

officers and agents, for the purpose of examining, checking and verifying said certificates.

In case any contracting municipality shall request sewage capacity in excess of what would be allotted to it for sewage, including ten per centum of factory waste, provision may in said contract be made for the enlargement of said sewer or sewers, plant and works, in order to accommodate, take care and dispose of a larger quantity of factory waste, such increase in accommodation to be made at the expense of the municipality making requisition therefor.

178 The cost of maintenance, repair and operation of said sewer or sewers, plant and works shall, by the terms of said contract, be apportioned annually to the respective municipalities entering into said contract, according to the amount of sewage by them respectively delivered or discharged into any sewer or sewers or other receptacle provided or constructed by the said sewerage commissioners for the reception of the same.

The said contract shall provide for the construction by the Passaic Valley Sewerage Commissioners of an intercepting sewer or sewers, plant and works, reasonably sufficient in size and capacity to intercept and dispose of sewage and other polluting matter of the contracting municipalities for the present, and, so far as can be estimated and foreseen, for the future, and said sewer or sewers, plant and works may differ substantially in details from the preliminary maps, plans, specifications and estimates submitted to the municipalities as hereinbefore directed.

And the several contracting municipalities and the Passaic Valley Sewerage Commissioners are hereby vested with absolute discretion in the determination of the size and capacity of such intercepting sewer or sewers, plant and works.

Any contract made or entered into pursuant to the provisions of this act shall provide for the building, repairing, operating, maintaining and cleaning of any such intercepting sewer or sewers, plant and works, and for the purchase of the necessary lands, rights in land and other property by the Passaic Valley Sewerage Commissioners, and for the payment of the cost and expense thereof by the several contracting municipalities to the said commissioners.

The total cost and expense of constructing said intercepting sewer or sewers, plant and works, shall include as a part thereof
179 the expenses of the Passaic Valley Sewerage Commissioners heretofore incurred and not otherwise provided for, not exceeding the sum of twenty-five thousand dollars ($25,000), also the cost of preliminary maps, plans, specifications and estimates herein referred to; also, the salary or other compensation of the said commissioners up to the completion of said intercepting sewer or sewers, plant and works, together with all incidental expenses of maintaining their corporate organization and clerical and engineering services, and the reasonable compensation of counsel which they are hereby authorized to employ.

The cost and expense of maintaining, repairing and operating said intercepting sewer or sewers, works and plant, shall include as a part thereof the salaries or other compensation of the said com-

missioners, also charges for clerical and engineering services, compensation of counsel and incidental expenses of maintaining their corporate organization.

In all the contracts to be made between the municipalities and the Passaic Valley Sewerage Commissioners, pursuant to the terms of this act, the several municipalities so contracting shall undertake and agree, upon the request of the Passaic Valley Sewerage Commissioners, to exercise and put in operation all their powers of eminent domain for the condemnation of lands, rights in lands and other property for the benefit of such joint enterprise, either within or outside the territory of such contracting municipalities.

Upon the making of the contract hereby authorized the Passaic Valley Sewerage Commissioners shall have full power in their own corporate name to purchase and acquire all lands, rights and interests in lands, either within or outside the territory of the joint contracting municipalities, which may be necessary for the con-
180 struction of such intercepting sewer or sewers, and its appurtenances, and for this purpose are authorized to condemn the same in the manner provided by the general laws of this State relating to the condemnation of lands for public use.

Upon the making of such contract the Passaic Valley Sewerage Commissioners are further authorized and empowered to erect, construct, maintain, and operate such intercepting sewer or sewers and appurtenances, together with all works, machinery, appliances, and other things requisite or useful for the purposes to be accomplished by the same.

It shall be lawful for the Passaic Valley Sewerage Commissioners, in the execution of said works, to build and construct said intercepting sewer or sewers and the necessary appurtenances thereto, to the point or points of discharge and disposal determined by said contract, and for this purpose to pass through or partly through territory situated within the bounds of any other municipality than those contracting with it for the construction of said work, and they shall have full power to construct such intercepting sewer or sewers, and its appurtenances, along, under, and over any watercourse, or under or over or along or across any street, turnpike, road, railroad, highway or other way, or public park or grounds, and in or upon private or public land under water; in such way and manner, however, as not necessarily to obstruct or impede travel or navigation, and may enter upon and dig up any street, highway or private or public land, for the purpose of constructing said work and appurtenances and for repairing and maintaining the same, and in a general way to do all other acts and things necessary, con-
181 venient, and proper in connection with the making and maintaining of the improvement contemplated by the provisions of this act. The highways dug up and disturbed shall be restored to their former condition as near as may be.

Whenever any work to be performed or material to be furnished shall involve an expenditure of any sum of money exceeding the sum of two thousand dollars ($2,000) the Passaic Valley Sewerage Commissioners shall designate the time when they will meet at their

usual place of meeting to receive proposals in writing for doing the work and furnishing the material; and said Commissioners shall order its clerk to give notice by advertisement inserted in at least two newspapers printed and circulating, respectively, in two of the counties of said district, at least ten days before the time of such meeting, of the work to be done and material to be furnished, of which at the time of such order they shall cause to be filed in their office particular specifications.

All proposals received shall be publicly opened by the said Commissioners and the Commissioners shall award the contract to the lowest responsible bidder; all contractors shall be required to give bond satisfactory in amount and security to the Passaic Valley Sewerage Commissioners.

6. For the purpose of defraying the cost and expense of the construction of such intercepting sewer or sewers, plant and works, and appurtenances, and of making the payments which shall be designated and required to be made by such joint contract, the governing body or board in charge of the finances of each contracting municipality is hereby authorized and empowered to borrow the money necessary to make such payments upon the notes or
182 other temporary obligations of such municipality, which notes or obligations may be renewed from time to time until permanent bonds shall have been issued by such municipality to take up and pay for the same.

And each contracting municipality shall have the power and is hereby authorized, from time to time to issue its bonds for the purpose of raising money necessary to pay its notes or other temporary obligations, including interest, issued and outstanding for the purpose hereinbefore stated, or to make any of the payments required by the said contract, which said bonds shall be in such amounts and bear interest at such rate, not exceeding six per centum per annum, and shall be payable at such time and place as the governing body or board having charge of the finances of such municipality shall by resolution, duly adopted, determine.

The total amount of indebtedness incurred and of bonds issued by any municipality under the authority of this act shall not exceed five per centum of the tax ratables within such municipality, as shown by its official books of the last assessment for taxes therein, but said indebtedness and bonds shall be held to be authorized in addition to the amount of indebtedness and bonds fixed by the charter or general act as a limitation beyond which such municipality may not incur indebtedness or issue bonds, and said indebtedness and bonds authorized by this act shall not be taken to be included within or governed by any such limitation.

Upon the making of any such contract as is herein provided for the Passaic Valley Sewerage Commissioners are authorized and empowered to borrow upon their corporate notes, or other temporary obligations, any moneys which may be required by them in the
183 performance of the said contract, for the payment of which moneys so borrowed said contract with the several municipalities executing the same shall be security.

8. Any time after the making of a contract in accordance with the provisions hereof, the Passaic Valley Sewerage Commissioners may, with the consent of the municipalities which have contracted with them enter into further contract or contracts with any other municipality, or person or corporation, for the use of the said intercepting sewer or sewers and appurtenances, and for participation in the benefits and in the cost of construction, operation and maintenance of the same, upon such terms and conditions as may be agreed upon in any such contract or contracts.

And the said last-mentioned municipality or municipalities shall have like power to borrow money, make and issue notes or other temporary obligations and bonds, as is given by this act to the municipalities first entering into contract with the Passaic Valley Sewerage Commissioners.

9. Upon the completion of such intercepting sewer or sewers, plant and works, and appurtenances, the Passaic Valley Sewerage Commissioners are authorized and directed to retain and have the sole control and charge of the said sewer or sewers, plant and works, and appurtenances and every municipality using such intercepting sewer or sewers, plant and works, is hereby required to pay annually to the Passaic Valley Sewerage Commissioners, on demand, its proportion of the cost of maintenance and operation of the same, as the same may be certified to it from time to time by the Passaic Valley Sewerage Commissioners, pursuant to the terms of said contract,
184 which said cost of maintenance and operation shall be raised and provided for by the said municipalities by taxation or by the issue of temporary loan bonds in anticipation of taxation.

In case the sewer or sewers, plant or works, first contracted to be built under this act shall not be built and put in practical operation by the twelfth day of December, one thousand nine hundred and ten, then and in that case the municipalities lying in whole or in part within the Passaic Valley Sewerage District, and not entering into contract with the Passaic Valley Sewerage Commissioners for the construction of an intercepting sewer or sewers, plant or works under this act, shall have two years from the time within which such sewer or sewers shall be put into practical operation within which to cease to discharge all sewage and other polluting matter into the said portion of the said river.

It shall be the duty of the Comptroller of this State to cause the accounts of the Passaic Valley Sewerage Commissioners to be annually audited at the expense of the Passaic Valley Sewerage Commissioners, and the result of such audit shall be printed with the financial report of the Passaic Valley Sewerage Commissioners. The said Board of Sewerage Commissioners shall at all times keep full and accurate account of its receipts and expenditures and liabilities, and shall annually cause a detailed statement thereof to be published and a copy thereof mailed to the clerk of each of the contracting municipalities. Said commissioners shall be liable for any unlawful act, as are now members or officers of any public body, and no commissioner shall be, directly or indirectly, interested in any contract awarded under the provisions of this act, or in furnishing material,

or supplies therefor to any contractor, or in furnishing
185 security for the performance of any contract.

In case the city of Paterson shall, pursuant to the provisions of this act, enter into contract with the Passaic Valley Sewerage Commissioners for the construction of an intercepting sewer or sewers, plant and works and appurtenances, then and in that case the said city shall turn over to the Passaic Valley Sewerage Commissioners all plans, maps, data and reports which it may have produced, purchased or secured, and which it may now own relating to the subject of sewerage and sewage disposal, and the Passaic Valley Sewerage Commissioners shall credit to the city of Paterson therefor on said contract the sum of eight thousand dollars ($8,000), and the said sum shall be taken to be a part of the construction cost of said sewer or sewers, plant and works.

10. In case, for any reason, any section or provision of this act shall be questioned in any court, and shall be held to be unconstitutional or invalid, the same shall not be held to affect any other section or provision of this act.

11. For the purpose of removing any doubt which may exist as to the corporate power and authority of the Passaic Valley Sewerage Commissioners to enter into and perform the contracts herein and hereby authorized, and to execute and perform the duties herein imposed upon the said Commissioners, the said Passaic Valley Sewerage Commissioners heretofore appointed, and their successors in office, are and shall continue to be a body politic and corporate, with perpetual succession under the name of Passaic Valley Sewerage Commissioners, with power to sue and be sued, with power to adopt and use a corporate seal, and with the right, power and authority to acquire, hold, use and dispose of all such property, real or
186 personal, as may be proper or necessary, and with all other power or authority proper or necessary to carry out and effectuate the purposes for which the said board is created.

12. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

13. This act shall take effect immediately.

Approved March 18, 1907.

187 (Endorsed:) No. 9. Original. In the Supreme Court of the United States, October Term, 1908. The People of the State of New York, Complainants, v. The State of New Jersey. Petition of the United States for leave to intervene. Filed Jan'y 25, 1909.

188 And afterwards to wit, on the 8th day of November, A. D., 1909, the following entry appears of record, viz:

6. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainant,
vs.
THE STATE OF NEW JERSEY et al.

On motion of Mr. Maurice B. Dean, of counsel for the Complainant, leave is hereby granted to file a replication herein.
November 8, 1909.

And on the same day, to wit, the 8th day of November A. D. 1909, the motion to file Replication and the Replication were filed in words and figures following, viz:

189 In the Supreme Court of the United States, October Term, 1909.

In Equity. No. 6, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants; THE UNITED STATES, Intervenor.

Motion to File Replication to Answer.

To the honorable the Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

Now come the People of the State of New York by Maurice
190 B. Dean, their counsel, and move the Court for leave to file their replication to the answer herein.
Dated, November 8, 1909.

EDWARD R. O'MALLEY,
Attorney General of the State of New York.
MAURICE B. DEAN,
Special Counsel.

20 Broad Street, New York City.

[Endorsed:] Supreme Court of the United States, October term, 1909. No. 6, original. The People of the State of New York complainants, against State of New Jersey and Passaic Valley Sewerage Commissioners, defendants; The United States, Intervenor. Motion to file replication to answer. Edward R. O'Malley, attorney general of the State of New York. Maurice B. Dean, special counsel.

191 (Endorsed:) Supreme Court of the United States, October Term, 1909. No. 6. Original. The People of the State of New York, Complainants, vs. State of New Jersey and Passaic Valley Sewerage Commissioners; The United States, Intervenor. Motion to File Replication to Answer. Edward R. O'Malley, Attorney General of the State of New York. Maurice B. Dean, Special Counsel. Filed Nov. 8, 1909.

192 In the Supreme Court of the United States, October Term, 1909.

In Equity. No. 6. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants; THE UNITED STATES, Intervenor.

Replication.

The repliants, The People of the State of New York, saving and reserving to themselves all and all manner of advantage of exceptions which may be had and taken to the many manifold errors, uncertaintites and insufficiencies of the answer of the defendants herein, for replication thereunto say that they do and will aver, maintain, and prove their said bill to be true, certain and sufficient in the law to be answered unto by the said defendants and each of them; and that the said answer of the said defendants, and each of them, is very uncertain, evasive, untrue and insufficient in law to be
193 replied unto by these repliants; without that, that any other matter or thing in the said answer contained material or effectual in the law to be replied unto, confessed or avoided, traversed or denied is true.

All of which matters and things these repliants are ready to aver, maintain, and prove as this Honorable Court may direct, and respectively pray as in their said bill they have prayed.

EDWARD R. O'MALLEY,
Attorney General of the State of New York.
MAURICE B. DEAN,
Special Counsel.

20 Broad Street, New York City.

[Endorsed:] Supreme Court of the United States, October term, 1909. No. 6, original. The People of the State of New York, complainants, against State of New Jersey and Passaic Valley Sewerage Commissioners, defendants; The United States, Intervenor. Replication. Edward R. O'Malley, attorney general of the State of New York. Maurice B. Dean, special counsel.

194 (Endorsed:) Supreme Court of the United States, October Term, 1909. No. 6. Original. The People of the State of New York, Complainants, vs. State of New Jersey et al. Replication. Filed Nov. 8, 1909.

195 And afterwards, towit, on the 16th day of May, A. D. 1910, the following entry appears of record, viz:

6. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY et al.; THE UNITED STATES, Intervenor.

On motion of Mr. Solicitor General Bowers, of counsel for The United States, and in pursuance of a stipulation to that effect, It is now here ordered by the Court that the intervening petition of the United States herein be, and the same is hereby, dismissed without prejudice.
May 16, 1910.

And on the same day, towit, on the 16th day of May, A. D. 1910, the Stipulation that intervening petition be dismissed was filed in words & figures following, viz:

196 In the Supreme Court of the United States, October Term, 1909.

In Equity. No. 6, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
v.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants; THE UNITED STATES, Intervenor.

It is hereby stipulated by and between the United States, intervenor in the above entitled cause, and the State of New Jersey and Passaic Valley Sewerage Commissioners, defendants in said cause, that the petition of intervention by the United States in said cause be forthwith dismissed without prejudice.

GEORGE W. WICKERSHAM,
Attorney General of the United States.
ROBERT H. McCARTER,
Special Counsel for State and for Edmund Wilson,
Attorney General of the State of New Jersey.
CHANDLER W. RIKER,
Solicitors for and of Counsel with
Passaic Valley Sewerage Commissioners.

197 In the Supreme Court of the United States, October Term, 1909.

In Equity. No. 6, Original, on the Docket for said October Term.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
v.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Stipulation.

The United States having intervened in the above entitled suit with the consent of the court, and it being desired by the United States and the Defendants in the suit to adjust the matters in controversy between them, in the manner and upon the terms and conditions hereinafter stated, and the State of New Jersey, by an act of its Legislature, approved on the eighth day of April, nineteen hundred and ten, having authorized the defendant, the Passaic Valley Sewerage Commissioners, to make this adjustment, it is now stipulated and agreed by and between the United States and the Passaic Valley Sewerage Commissioners, defendants in the suit, as follows:

First. The Passaic Valley Sewerage Commissioners agree with the United States that the sewage system to which the suit relates shall be constructed, maintained and operated if at all, in accordance with the following requirements:

(*a*) Upon the line of the trunk sewer which it is proposed shall be constructed and at a point at or near the pumping station
198 to be located on the Newark Meadows near the Newark Bay, it is stipulated and agreed that the sewage, waste and other matter passing through the said trunk sewer shall first pass through coarse screens to remove therefrom all large floating matter, and after passing through such coarse screens shall pass through a grit basin or basins where the heavy matter therein shall be taken out as far as practicable, from which basin or basins the sewage and other matter shall pass through self-cleaning mechanical screens having clear openings of not over 4/10 of an inch.

(*b*) As the sewage comes from the fine screens, it shall also pass through sedimentation basins. The sewage after passing through and said grit basin and self-cleaning mechanical screens shall enter the sedimentation basins or settling tanks consisting of a number of units, each approximately 225 feet long and 15 feet deep. Each tank will have a normal capacity of not less than 1,250,000 gallons, making an aggregate tank capacity sufficient to meet the requirements as stated herein. The tank capacity shall always be such as to provide a detention period of not less than one hour at the maximum rate of flow of the sewage and a detention period of the daily average flow of such sewage for not less than one hour and a half. The mean lineal velocities through said tanks shall not be over 0.5 inch per second for average flow, and

0.75 inch per second for the maximum flow. In addition to and in connection with these basins scum boards shall be provided to retain the floating matter, and proper and adequate devices shall be used to remove the retained scum and deposits from the settling basins; drawings of the general plan of said settling tanks
199 (sedimentation basins) as proposed at the outset being herewith attached as Appendix A.

(*c*) The sewage and waste thus screened and settled is then to flow into a pump well, whence it is to be pumped under pressure through a tunnel to a point in the New York Bay near Robbins Reef Light, at which point it is agreed that the matter passing through the said tunnel shall be dispersed into the waters of the New York Bay through a series of outlets discharging forty feet or more beneath the surface of the water at mean low tide. From the end of the tunnel connections shall be made with four or more discharge pipes extending across the current, spaced about one hundred feet apart, laid in trenches on the bottom of the Bay, and of a size decreasing in diameter from about six feet to two feet. On the top of these discharge pipes will be a series of not less than one hundred and fifty tees of a diameter not exceeding one foot, and spaced approximately ten feet apart. On each of these vertical tees shall be placed outlets arranged to discharge horizontally across the tidal current, and the extent of the dispersion area used for this system of outlet pipes shall cover at least 3.5 acres of the bottom of the Bay.

Second. The Passaic Valley Sewerage Commissioners further agree with the United States that in the operation of said sewer system at all times the following results shall be secured, either through compliance with the requirements of the immediately preceding paragraphs, or through requisite lawful additional arrangements, viz:

(1) There will be absence in the New York Bay of visible suspended particles coming from the Passaic Valley sewage.

200 (2) There will be absence of deposits objectionable to the Secretary of War of the United States in the New York Bay coming from the Passaic Valley sewage.

(3) There will be absence in the New York Bay and its vicinity of odors due to the putrefaction of organic matters contained in the Passaic Valley sewage thus discharged.

(4) There will be a practical absence on the surface of New York Bay of any grease *of* color due to the discharge of the Passaic Valley sewage at the dispersion area or elsewhere.

(5) There will be no injury to the public health which will be occasioned by the discharge from the said sewer into the Bay of New York in the manner proposed and no public or private nuisance will be created thereby.

(6) The absence of injurious effect from said sewage discharge, upon the property of the United States situated in the Harbor of New York.

(7) The absence of reduction in the dissolved oxygen contents

of the waters of New York Bay, resulting from the discharge of Passaic Valley sewage, to such an extent as to interfere with major fish life.

Third. The said Passaic Valley Sewerage Commissioners further agree with the United States that so long as said sewer system, or part thereof, is operated, the United States shall have through such representatives as may be designated by the Secretary of War at any time for such purpose, full opportunity to inspect the condition and working of the sewer system, with a view to determining whether this contract is being in all respects performed, and that the said Passaic Valley Sewerage Commissioners will render such expert or other assistance as the United States may de-
201 sire in the course and in the aid of such inspection and determination.

Fourth. The United States agrees with the Passaic Valley Sewerage Commissioners that forthwith upon the filing of this agreement, property executed, in the office of the Clerk of the Supreme Court as a stipulation of the parties in the suit, it will discontinue its intervention in the above entitled suit and will cause its petition of intervention to be dismissed without prejudice, and will not again intervene in said suit.

Fifth. The United States and the Passaic Valley Sewerage Commissioners mutually agree that this contract shall not become effective in any part, except the next succeeding divisions, unless or until all such permits as would be requisite under the statutes of the United States for the construction, maintenance or operation of said sewer system without this contract are actually obtained from the United States, or unless or until such permits are made conditional upon compliance at all times with all the terms and requirements of the divisions of this contract numbered First and Second, whether or not such permits contain other terms or conditions.

Sixth. The Passaic Valley Sewerage Commissioners hereby consent that full compliance at all times with the terms and requirements of the First and Second divisions of this contract be made express conditions of any permits issued by or on the part of the United States for construction, maintainance or operation of said sewer system, and agree with the United States that this contract shall establish such consent before alll officers of the United States.

202 Seventh. It is agreed between the United States and the Passaic Valley Sewerage Commissioners that this contract shall bind and also shall enure to the benefit of the successors of the latter.

In witness whereof this instrument has been executed in triplicate; being signed in the name and on behalf of the United States by the Attorney General of the United States and in the name of and on beh*lf* of the Passaic Valley Sewerage Commissioners by their president, and being sealed also on behalf of said Passaic Valley Sewerage Commissioners with their corporate seal attested by their

secretary; all on the fourteenth day of April, Nineteen hundred and ten.

THE UNITED STATES OF AMERICA,
By GEORGE W. WICKERSHAM,
Attorney General.
THE PASSAIC VALLEY SEWERAGE COMMISSIONERS,
By JULIUS A. LEBKUECHER,
Chairman and President.

Attest:

[SEAL.] JOHN S. GIBSON,
Secretary and Clerk.

203 In the Supreme Court of the United States, October Term, 1909.

In Equity. No. 6. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants; THE UNITED STATES, Intervenor,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

In behalf of the State of New Jersey I approve of and consent to the making of the foregoing stipulation, and consent that the United States discontinue its intervention in the above entitled cause, and that the petition of intervention of the United States be dismissed without prejudice.

Dated April 14, 1910.

ROBERT H. McCARTER,
Special Counsel.

(Here follows map marked page 203½.)

Endorsed: Supreme Court U. S. October Term 1909. Term No. 6. Original. The People of the State of New York, Complainants, vs. The State of New Jersey et al. Stipulation that intervening petition of United States be dismissed without prejudice. Filed May 16, 1910.

204 And afterwards, to wit, on this 12th day of December, A. D. 1910, the following entry appears of record, viz:

5. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainant,
vs.
STATE OF NEW JERSEY et al.

The motion of the City of New York for leave to intervene in this cause was submitted to the consideration of the Court on printed arguments by Mr. William H. Jackson in support of the same, and Mr. Joseph Coult, Mr. Robert H. McCarter and Mr. Edmund Wilson in opposition thereto,
December 12, 1910.

Which said motion is in the following words, viz:

205 Supreme Court of the United States, October Term, 1910.

No. 4. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS.

(1) Motion on Behalf of the City of New York for Leave to Intervene.
(2) Notice on Behalf of the City of New York for Leave to Intervene.
(3) Petition of Intervention in Behalf of the City of New York.

ARCHIBALD R. WATSON,
Corporation Counsel for the City of New York.

WILLIAM H. JACKSON,
Of Counsel.

206 In the Supreme Court of the United States, October Term, 1910.

No. 5. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS.

Motion on Behalf of the City of New York for Leave to Intervene.

Comes now The City of New York, by Archibald R. Watson, its corporation counsel, and moves the court for leave to intervene in the above-entitled cause, and for such purpose to file herein its petition, a copy of which is attached hereto, marked "A."

As cause for this motion it is shown:

1. The navigable capacity and future improvement and preservation of one of the principal navigable waters of the United
207 States, to wit, the upper bay and harbor of the port of New York, being within the territorial jurisdiction of the City and State of New York, are threatened, as disclosed in the subject-matter therein set forth.

2. Commerce between the various States of the Union and between the United States and foreign countries, at the port of New York, is threatened, as set forth in said petition.

3. A very large amount of property belonging to the City of New York will be affected injuriously, as therein set forth, and consequently affected by the decision of this court therein.

4. Quarantine regulations, sanitation and the public health, welfare and prosperity of the inhabitants of the City of New York are involved in said suit.

5. The questions presented in said suit are of such a character that their determination will vitally affect the interest of the City of New York and the general welfare of its inhabitants.

ARCHIBALD R. WATSON,
Corporation Counsel.

WILLIAM H. JACKSON,
Of Counsel.

[Endorsed:] No. 5, original. In the Supreme Court of the United States, October Term, 1910. The People of the State of New York, complainants, against The State of New Jersey and Passaic Valley Sewerage Commissioners, defendants. (Original.) Motion on behalf of the City of New York for leave to intervene. Archibald R. Watson, Corporation Counsel, Hall of Records, Borough of Manhattan, New York City.

208 In the Supreme Court of the United States, October Term, 1910.

No. 5, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Notice on Behalf of the City of New York for Leave to Intervene.

To the People of the State of New York, complainants in the above-entitled suit, and to The State of New Jersey and Passaic Valley Sewerage Commissioners, defendants therein, and to The United States, intervenor therein:

You, and each of you are hereby notified that on Monday, December 12, 1910, the corporation counsel of the City of New York will move the above court on behalf of the said City of New York for leave to intervene in the above suit, and for such purpose to file its petition therein. A copy of said proposed motion and petition are hereto attached.

ARCHIBALD R. WATSON,
Corporation Counsel.

WILLIAM H. JACKSON,
Of Counsel.

[Endorsed:] No. 5, Original. In the Supreme Court of the United States October term, 1910. The People of the State of New York, complainants, against The State of New Jersey and Passaic Valley Sewerage Commissioners, defendants. (Original.) Notice on behalf of the City of New York for leave to intervene. Archibald R. Watson, Corporation Counsel, Hall of Records, Borough of Manhattan, New York City.

209 Supreme Court of the United States, October Term, 1910.

In Equity. No. 5, Original.

PEOPLE OF THE STATE OF NEW YORK, Complainant,
against
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants; THE CITY OF NEW YORK, Intervenor.

Petition of Intervention in Behalf of the City of New York.

To the Honorable Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

Comes now The City of New York, a municipal corporation duly organized and existing under and by virtue of the laws of the

State of New York, by Archibald R. Watson, its corporation counsel, and, by leave of the court first had and obtained, files this its petition of intervention; and thereupon your petitioner humbly alleges upon information and belief and prays as follows:

First. On October 13, 1908, on the motion of the Attorney General of the State of New York, the permission of this honorable court was granted the said Attorney General of the said State of New York to file an original bill of complaint in equity in behalf of "The People of the State of New York" against "The State of New Jersey and Passaic Valley Sewerage Commissioners," setting out in substance the subject-matter of this petition for intervention
210 as relating to and affecting the interest of the people of the State of New York, describing the sewerage project hereinafter described and praying that the defendants, The State of New Jersey and the Passaic Valley Sewerage Commissioners, make answer to the matters in said bill of complaint in equity there stated and charged, and that said defendants be required to show cause, if they can, why the defendants aforesaid, their officers, agents, servants, and employees, and all other persons acting or pretending to act by or under the authority of the State of New Jersey or the Passaic Valley Sewerage Commissioners, be enjoined and restrained by a writ of injunction from constructing or causing or permitting to be constructed, the sewer and sewerage plant hereinafter described in this petition, or any part thereof, or any other sewer, sewerage plant, or works substantially similar thereto in design or effect, or designed or intended to conduct into the waters of Upper New York Bay and Harbor the sewage or drainage of the Passaic Valley Sewerage District, or of any part thereof; and from receiving into any sewer, sewage plant, or works, with a view to or for the purpose of discharging any part thereof into the waters or bays and harbor aforesaid, and from discharging or procuring or suffering to be discharged into the said waters the sewage or drainage of the said district, or any part thereof, and from otherwise defiling or polluting said waters, or procuring them to be defiled or polluted by the discharge of said sewage therein; that said original suit instituted as aforesaid is now pending on the docket of this honorable court as Original, No. 9, and that said defendants have duly made answer, which has been filed herein; and that the United States of America, by its Attorney General, has also by leave of court filed its petition of intervention on behalf of the United States herein:

Second. The plaintiff in said suit "The People of the State of New York," is the legal title of a State of the Union, to-wit, the State of New York. The defendant, The State of New Jersey, is one of the States of the Union, and The City of New York, intervenor herein, is a municipal corporation duly created, organized, and ex-
211 isting under and by virtue of the laws of the State of New York and its ancient charters. The said City of New York is through its Department of Health granted full and complete authority and powers of police regulation over the waters within the jurisdiction of said city and within the waters of the bay within quarantine limits as established by law; and said pow-

ers and duties of police regulation and control, which would otherwise belong to the State of New York, are fully conferred upon the said City of New York by Laws of 1882, chapter 410, paragraph 41, being section 1168 of the charter of Greater New York. A copy of said act is hereto attached, marked Exhibit "A," and made a part hereof. The waters of New York Bay into which the defendants threaten and intend to empty its sewage, as hereinafter stated, are within the territorial jurisdiction of the State and City of New York, and the property of said city in said waters includes among other things numerous docks, wharves, and piers, as well as a great number of ferry-boats plying between Manhattan Island and Staten Island, all of which as well as the health and comfort and general welfare of its citizens will be most injuriously, materially and directly affected by the acts of the defendants hereinafter set forth.

Third. The boundary line between the two States of New York and New Jersey from a point in the middle of the Hudson River opposite the point on the west shore thereof in the 41st degree of north latitude to the main sea is the middle of the said river, of the Bay of New York, of the waters between Staten Island and New Jersey and of Raritan Bay to the main sea. The City of New York, by authority derived from the State of New York, as hereinbefore alleged, has and exercises police jurisdiction over the waters of the Bay of New York and over all the waters of the Hudson River lying west of Manhattan Island and to the south of
212 the middle of Spuyten Duyvil Creek and of and over the lands covered by the said waters to the low-water mark on the westerly or New Jersey side thereof, subject, however, to the exclusive right of property in the State of New Jersey in and to the land under water lying west of the middle of the Bay of New York and west of the middle of that part of the Hudson River which lies between Manhattan Island and New Jersey, as more particularly will appear by the compact or agreement entered into between the State of New York and the State of New Jersey in the year 1833, ratified by the legislature of the State of New York by an act passed February 5, 1834, constituting chapter 8 of the Laws of 1834, and by the legislature of the State of New Jersey by an act passed February 28, 1834, and approved by Congress by an act passed June 28, 1834, constituting chapter 126 of the Laws of 1834, and a copy of the said compact, as the same is embodied in the said act of February 5, 1834, is annexed hereto as Exhibit "B" and made a part hereof.

So much of that part of New York Bay which is commonly called the Upper Bay as belongs to the State of New York, and over which the City of New York has police jurisdiction as aforesaid, is bounded by the City of New York on the north, east, and south; on the west the Upper Bay is bounded by the State of New Jersey. The shore line of the City of New York bordering on the Upper Bay is upwards of thirteen miles in length; the Hudson River and the East River flow into the Upper Bay within the city. The water front of the city bordering on these rivers and on the

bay is improved with numerous wharves, piers and docks owned by the City of New York and by private parties, which are used for the purpose of commerce, and some of them also, as well as the natural shores of the bay within the city, are used for the health and pleasure of the inhabitants. The City of New York, according to the census of 1910, has a population of 4,766,883.
213 The real property in the city is of the value of upwards of $7,044,192,000. The personal property of the inhabitants of the city, which is assessed for taxation, is of the value of upwards of $372,645,000, while the actual value of the personal property, including that which is not taxed, is many times that amount.

North of the 41st degree of north latitude the Hudson River lies wholly within the State of New York; the tide ebbs and flows in it and it is navigable as far as Albany, 150 miles or thereabouts north of New York Bay. It is navigated by a large number of vessels, many of which are engaged in commerce between the City of New York and other States of the Union, or with other countries.

The State of New Jersey lies in part along the westerly side of New York Bay, having a shore line of about seven miles.

Fourth. The State of New Jersey, by its legislature, in the year 1902 enacted a law contituting chapter 48 of the laws of New Jersey of 1902, approved March 27, 1902, entitled "An act to create a sewerage district to be called Passaic Valley Sewerage District," a copy of which said act is annexed hereto, marked Exhibit "C," and made a part hereof; and in the year 1907 enacted a law constituting chapter 10 of the Laws of New Jersey of 1907, approved March 18, 1907, entitled "An act to provide for the purification of the waters of the Passaic River within the Passaic Valley Sewerage District, prohibiting the discharge of sewage or other polluted matter into said portion of said river after December 12, 1912, and authorizing municipalities lying in whole, or in part, within the Passaic Valley Sewerage District, or the territory of which the sewage or other polluted matter is or may be discharged into said portion of said river, to enter into contracts with each other and with the Passaic Valley Sewerage Commissioners for the intercepting and disposal of such sewage and other polluted matter, and
214 to provide the necessary funds therefor." Copy of said act is annexed hereto, marked Exhibit "D," and made a part hereof.

Fifth. The defendants The Passaic Valley Sewerage Commissioners, acting as a governmental agency of the defendant The State of New Jersey, and by virtue of and in execution of the authority conferred upon them by that State in and under its supervision, control and approval, pursuant to the provisions of said chapter 48 of the Laws of New Jersey of 1902 and of said chapter 10 of the Laws of New Jersey of 1907, have prepared and adopted maps, plans, specifications and estimates of cost or the construction of a joint trunk or main intercepting sewer and their plant and works for collecting and discharging the sewage of the Passaic Valley Sewerage District referred to in said laws, comprising altogether the natural drainage area of the Passaic River in the State of New Jersey, and on April 20, 1908, the said commissioners

adopted a plan in substance as follows: "The main sewer district to begin in Paterson in the State of New Jersey at Prospect street, a short distance below the Great Falls, being a distance of about 26 miles from Upper New York Bay; thence continuing in general down along the west bank of the Passaic River until it reaches the city of Newark, where it will cross the Newark Meadows to the shore of Newark Bay, where it is proposed to pass the sewage through a grit chamber intended to remove gravel, sand and other heavy matter and through a screen chamber intended to remove large floating matter, and thence into a pumping station, where the sewage will be raised to an elevation of about 15 feet above high water for the purpose of giving it head, and thence to continue the sewer through a tunnel under Newark Bay, and under the cities of Bayonne and Jersey City, in the State of New Jersey, and through the soil underlying the waters of New York Bay to a point in the bay about half a mile north of Robin's Reef
215 Light, on the westerly edge of the main ship channel, where it is intended to discharge the said sewage into the waters of the bay from the outlet or outlets of the sewer.

The plan shows that the area of the Passaic Valley Sewerage District is about 103.23 square miles. The population of the municipalities whose territory the proposed sewer is intended to drain was, in the year 1905, as ascertained by the Federal census, 601,817 persons, and the said commissioners' estimate that by the year 1911, when it is proposed to have the sewer ready for operation, the population of the said territory will be upward of 700,000 persons, and by the year 1940 it will be upward of 1,640,000 persons.

The average amount of sewage flow per 24 hours for the said natural drainage area of the Passaic River in the year 1905 is ascertained by the said commissioners to have been 89,000,343 gallons, and by the year 1940 the average amount of sewage flow based upon the said estimated population of 1,640,000 is estimated by the said commissioners at upward of 357,365,000 gallons per 24 hours.

Sixth. The said Passaic Valley Sewerage Commissioners threaten and intend to build the said proposed sewer substantially as hereinbefore stated, and intend to gather into it the sewage of the sewerage district aforesaid and to discharge the same into the waters of New York Bay, and up to the present time about twenty or twenty-five of the thirty municipalities within the said natural drainage area of the Passaic River have consented to and approved the said project of the commissioners and have agreed to adopt and use the said proposed sewer for the drainage of their respective localities, and that the amount of sewage which the said district will furnish to the said sewer at the outset is upward of 120,000,000 gallons per 24 hours. The matter so intended to be discharged
216 contains not only the sewage of the individual inhabitants of the said thirty municipalities within the said Passaic Sewerage District, but also the refuse discharged from a great number of manufacturing plants of divers kinds, which is undefecated, disagreeable and offensive to the senses; it is poisonous

and otherwise injurious to human beings and other organisms, and to fish, oysters and clams, and is also injurious by its chemical or other action to wood and metal. While the plans of the commissioners state that grit and screen chambers will be built on the Newark Meadows to remove gravel, sand and other heavy materials, the commissioners themselves have admitted that no definite plans or specifications have been adopted for the construction of such grit and screen chambers; that the said plans are wholly indefinite and no assurance is given by said commissioners of the amount of solid matter which they propose to remove from the sewage of the said joint trunk or intercepting sewer, other than that under the most favorable circumstances they can remove only from 15 to 25 per cent of the solid matter in suspension, and your petitioner shows that approximately 60 per cent of the total solids of the sewage of the average American city is in solution, leaving 40 per cent in suspension; and if the commissioners remove at the outset 25 per cent of the solids in suspension, that would still leave 90 per cent of the entire solids in the sewage to be discharged into the waters of New York Bay, to the great detriment and injury of navigation and commerce between the City of New York and other places, and to the great injury of property of the said City of New York, and to the detriment of the health, comfort, and happiness of its citizens.

The grit screens through which the defendants allege in their answer herein that it is proposed to pass the said sewage, as shown by their plans, have an opening of about 4/10 inch, which opening would not materially prevent the escape of solids, but would, in fact, permit the discharge of large quantities of solid or crude sewage into the bay.

217 Seventh. The waters of the Bay of New York are not capable of dissipating and harmlessly disposing of the sewage and waste that are already being emptied therein; said waters of said New York Bay are already overtaxed by the sewage which is now discharged directly or indirectly into them, and are not capable of receiving, dissipating and harmlessly disposing of any further sewage that may be emptied therein.

For about two hundred years it has been necessary for cities bordering on the immediate water front of New York Bay and vicinity to discharge their sewage into the adjacent waters, and with the growth of population this discharge of sewage has increased to such an extent that property has been injured, the waters have become unsightly and offensive, animal organisms, fish, oysters, and clams have been almost destroyed, and the fish, oyster, and clam industry, upon which many citizens depended for a livelihood, has been almost destroyed. The City of New York alone has upward of 306 sewerage pipes constantly emptying sewage into the water of the bay, directly or indirectly. This is necessary in the case of the City of New York because of its being upon the immediate water front and because it has not sufficient territorial limits to admit of the establishment of purification plans.

To obviate this great evil and its detrimental effects to property and to the lives, health, and comfort of its citizens, the State of

New York has established a commission, known as the Metropolitan Sewerage Commission of New York, whose duties are, among other things, to devise some method of remedying the evils of emptying crude sewage into the bay and adjacent waters. The said commission has for a number of years given close attention to devising plans to meet the situation. Among other things, it is proposed by said commission to establish a system of intercepting pipes intersecting the main sewers in the City of New York, and to
218 establish sedimentation basins to take up and remove the solids, so that only the liquid sewage will be deposited in the adjacent waters, the solid matter being thereafter taken out to deep sea in ships or barges.

The matter of establishing purification plants to remove the existing evil is also being seriously considered by said commission.

Eighth. Any addition to the sewage at present being emptied into New York Bay, known as the Upper Bay, and adjacent waters, by the plan of the defendants to collect all the sewage from interior cities and towns from Paterson, New Jersey, a distance of 26 miles from the sea and within an area of 103.23 square miles, and conduct the same in crude, undefecated from to the bay, would create a condition injurious to property and commerce and intolerable to health and comfort.

Your petitioner is informed and believes, and therefore alleges, that such project is not necessary on behalf of the Passaic Valley Sewerage Commission; that the territorial limits of the Passaic Valley Sewerage Commission are all-sufficient for the purpose of establishing a purification plant, or for arranging to discharge the sewage of said district into the Newark Bay in New Jersey instead of into the New York Bay in the State of New York.

Ninth. While said defendants allege in their answer that the sewage is to be discharged into the Upper New York Bay through a number of outlets instead of through one large outlet about twelve feet in diameter as alleged in plaintiff's said bill of complaint, your petitioner is informed and believes, and alleges the same to be true, that any proposed plan of multiple outlets is not feasible, and is impractical, either of construction or of operation. The vast amount of sewage could not be dicharged through a number of small outlets, and any attempt to so discharge the same
219 would result in the necessity for the erection of one large outlet. The installation of a great number of smaller outlets by divers at the point in question would be impossible owing to the peculiar formation of the bay at that point and the congested condition of commerce. The location of the said outlet or outlets, as proposed by said Sewerage Commissioners, in New York Bay is in the Main Ship Channel, and even if the said outlet or outlets be installed 40 feet below the water's surface, as alleged in defendant's answer, yet at low tide the said outlet would seriously interfere with ocean steamers, drawing many feet of water, engaged in commerce between the City of New York and other places.

The phenomenal growth, greatness, and prosperity of New York City are lased largely upon its geographical location and the re-

sulting commerce carried on by ocean steamers. The commerce of the Port of New York includes the carriage of a great number of passengers, and of enormous quantities of merchandise upon ocean-going steamers and ships engaged in international and coastwise trade, and on ferry boats and other vessels plying on the waters of the bay and on the Hudson and East rivers. The transatlantic liners and nearly all the other steam ocean-going vessels and most of the other vessels of all descriptions that leave the Port of New York traverse the bay. The wealth and prosperity of the inhabitants of the City of New York have resulted very largely from the commerce of that port. One of the efficient causes that have obtained for the City of New York this commerce, and one of the most essential elements in retaining it in the future is the Bay of New York. Anything that tends to make the bay less serviceable or less attractive for commerce tends also to diminish the welfare of the City of New York, and also to the injury of the whole country, and the unsightly, offensive, and disagreeable matters and odors emanating from the proposed sewage outlet at the point in question, together with the practical interference of ocean steamers at this point of the Main Ship Channel would seriously interfere with the business and commercial interests of the City of New York, as well as with the happiness and comfort of its inhabitants.

Tenth. The alleged plan of defendants to discharge said sewage at a depth of forty feet below the surface of the water, as set forth in defendants' answer, would not prevent the injuries herein complained of, because the offensive matters being of higher specific gravity and also of higher temperature than sea water, and being greasy and also being emptied or forced into the sea with air pressure would necessarily rise to the height of the surface, and there remain for days until finally carried out to sea by the ebb and flow of the tide.

The Upper New York Bay is a navigable body of water in which there is a great volume of commerce, and wherein the tide ebbs and flows, and the chief trend of the currents is from the Hudson and East Rivers on the North, and the Kill van Kull on the West, through said Upper Bay and passing out at the southerly end through the Narrows into the Lower New York Bay. The tides oscillate between the Upper New York Bay and the Lower New York Bay, also a navigable body of water, through the Narrows, and while there is an excess of ebb over flood tide through the Narrows, yet, all the water which enters the Upper New York Bay, through the Hudson River, East River and Kill van Kull, does not immediately pass through the Narrows, but is mixed with the water of the Upper New York Bay by the currents—including a strong under-run moving upstream—and retained therein several days before passing through the Narrows on the ebb tide, and a large part returned through the Narrows on the flood tide, until gradually forced—while oscillating, as aforesaid—far enough out to sea to withstand the pressure of the flood tide; that the peculiar

formation of the Lower New York Bay, the Narrows and
221 the Upper New York Bay are such as to prevent the ready assimilation of the sewage entering the Upper New York Bay with the unpolluted water of the ocean, but that the tendency of the waters entering the Upper New York Bay are to oscillate through the Narrows between the Upper and Lower New York Bays for many days before finally settling, being assimilated, or reaching the ocean, during all of which time sedimentation to a certain extent is taking place. The continuous emptying of sewage into the bay as proposed by defendants would thus create a continuing nuisance and be permanently detrimental to the health, comfort and property interests.

Eleventh. The sewage so deposited in the waters of the bay will be borne by the currents and tides throughout the Bay and into the Hudson and East Rivers, and will be deposited on the bottom, and on the shores and about the wharves and docks and piers of the city and will pollute the said waters and shores, wharves and docks. The waters of New York Bay are largely used for bathing by the inhabitants of the City of New York, and said city supports free bath-houses wherein alone 1,800,000 baths were taken in the waters of New York Bay and the Hudson and East Rivers joining the bay, in the summer of 1907, besides all other bathers, and the said threatened and intended acts of the defendants, The State of New Jersey and The Passaic Valley Sewerage Commissioners would render the waters of New York Bay unwholesome and offensive and unsuitable for bathing.

Twelfth. In the light of modern sanitary science and engineering methods, there are other, better and more advanced methods for the disposal of the sewage hereinbefore described and as proposed and planned as aforesaid by the said Passaic Valley Sewerage Commission, so that the method adopted and planned as aforesaid for such disposition to the manifest and continued injury of
222 said described commerce and navigation, the public health and the port aforesaid, and the property of the City of New York is not necessary.

Thirteenth. The said threatened and intended acts of the defendant will be repeated and continued from day to day in perpetuity to the manifest and irreparable injury of the City of New York and the health, safety, comfort and welfare of its inhabitants and of others lawfully within the borders of said city, and your petitioner is without any adequate remedy at law in the premises.

This petitioner therefore prays that it may be permitted to intervene in this case and court, and may be permitted to take proofs, examine witnesses and be heard in argument, and also that this petitioner shall have such other and further relief in the premises as shall be found agreeable in equity and good conscience.

ARCHIBALD R. WATSON,
Corporation Counsel.

WILLIAM H. JACKSON,
Of Counsel.

223 Supreme Court of the United States. October Term, 1910.

In Equity. No. 5, Original.

PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants; THE CITY OF NEW YORK, Intervenor.

STATE OF NEW YORK,
County of New York, ss:

Douglas Mathewson, Deputy Comptroller of the City of New York, and an officer of the intervenor in the above entitled action, being duly sworn, says: That the foregoing petition is true to his own knowledge, except as to the matters therein stated to be alleged upon information and belief, and that as to those matters he believes it to be true. Deponent further says that the reason why this verification is not made by the intervenor is that it is a corporation; that this deponent is an officer of the same, to wit, Deputy Comptroller, and that the grounds of his belief as to all matters not therein stated upon his knowledge are as follows, to wit: information obtained from the books and records of the Metropolitan Sewerage Commission of New York, or of other departments of the city government, or from statements made to him by certain officers or agents of the intervenor.

DOUGLAS MATHEWSON.

Sworn to before me, this 19th day of November, 1910.
[NOTARIAL SEAL.] H. V. BROCKWAY,
Notary Public, Kings Co.

Certificate filed in New York Co.

224 EXHIBIT "A."

§1168. The authority, duty and powers of the department of health shall extend over the City of New York, and the waters adjacent thereto, within the jurisdiction of said city, and over the waters of the bay within the quarantine limits as established by law, but shall not be held to interfere with the powers and duties of the commissioners of quarantine or the health officer of the port. It shall be the duty of the department of health to make an annual report to the mayor of the City of New York, of all the operations of the department for the previous year. The mayor may at any time call for a fuller report, or for a report upon any portion of the work of said department, whenever he may deem it to be for the public good so to do. All the authiority, duty and powers heretofore conferred or enjoined upon the health departments, boards of health, health and sanitary officers in any of the municipal and public corporations or parts thereof, in any of the territory now

within or hereafter to become a part of the City of New York, as constituted by this act, and within the jurisdiction of said city, by chapter seventy-four of the laws of eighteen hundred and sixty-six, and the several acts amendatory thereof, and by any other subsequent laws of this State, and upon the several officers and members of said boards, by the laws constituting and appointing all such departments, boards of health and sanitary officers and members of boards, by the laws constituting and appointing all such departments, boards of health and sanitary officers, and giving or granting to them, or any of them, duties, and powers not inconsistent with the provisions of this act, are hereby conferred upon and vested in and enjoined upon and shall hereafter be exclusively exercised by the City of New York by the department of health, and board of health, created by this act, and by the officers of said board of health and the said department of health, and the same are to be ex-
225 ercised in the manner specified in said chapter seventy-four of the laws of eighteen hundred and sixty-six, and the several acts amendatory thereof, and by any other subsequent laws of the State relative to health and sanitary matters, and the prevention of pestilence and disease in said city of New York, or in any part thereof, and in conformity with the provisions of this act.

EXHIBIT "B."

Chapter 8, *Laws of* 1834.

An act to confirm the agreement entered into by the commissioners appointed by this State, and commissioners appointed by the State of New Jersey, to settle the boundary line between New York and New Jersey.

Passed February 5, 1834.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

The agreement entered into between the commissioners appointed by this State, and the commissioners appointed by the State of New Jersey, to settle the boundary line between New York and New Jersey, in the words following, viz:

"Agreement made between the commissioners on the part of the State of New York, and the commissioners on the part of the State of New Jersey, relative to the boundary line between the two States.

"Agreement made and entered into by and between Benjamin F. Butler, Peter Augustus Jay and Henry Seymour, commissioners duly appointed on the part and behalf of the State of New York in pursuance of an act of the legislature of the said State en-
226 titled, 'An act concerning the territorial limits and jurisdiction of the State of New York and the State of New Jersey,' passed January 18th, 1833, of the one part, and Theodore Frelinghuysen, James Parker and Lucius Q. C. Elmer, commissioners

duly appointed on the part and behalf of the State of New Jersey, in pursuance of an act of the legislature of the said State, entitled, 'An act for the settlement of the territorial limits and jurisdiction between the States of New Jersey and New York,' passed February 6th, 1833, of the other part.

"Article first. The boundary line between the two States of New York and New Jersey, from a point in the middle of Hudson River opposite the point on the west shore thereof, in the forty-first degree of north latitude, as heretofore ascertained and marked, to the main sea, shall be the middle of the said river, of the Bay of New York, of the waters between Staten Island and New Jersey, and of Raritan Bay, to the main sea, except as hereinafter otherwise particularly mentioned.

"Article second. The State of New York shall retain its present jurisdiction of and over Bedlow's and Ellis' Islands, and shall also retain exclusive jurisdiction of and over the other islands lying in the waters above mentioned, and now under the jurisdiction of that State.

"Article third. The State of New York shall have and enjoy exclusive jurisdiction of and over all the waters of the Bay of New York, and of and over all the waters of Hudson River lying west of Manhattan Island and to the south of the mouth of Spuyten Duyvil Creek, and of and over the lands covered by the said waters to the low-water mark on the westerly or New Jersey side thereof; subject to the following rights of property and of jurisdiction of the State of New Jersey, that is to say:

"1. The State of New York shall have the exclusive right of property in and to the land under water lying west of the middle of the Bay of New York and west of the middle of that part of the Hudson River which lies between Manhattan Island and New Jersey.

227 "2. The State of New Jersey shall have the exclusive jurisdiction of and over the walls, docks and improvements made, and to be made, on the shore of the said State, and of and over all vessels aground on said shore or fastened to any such wharf or dock; except that the said vessels shall be subject to the quarantine or health laws, and laws in relation to passengers, of the State of New York, which now exist or which may hereafter be passed.

"3. The State of New Jersey shall have the exclusive right of regulating the fisheries on the westerly side of the middle of the said waters, provided that the navigation be not obstructed or hindered.

"Article fourth. The State of New York shall have exclusive jurisdiction of and over the waters of the Kill van Kull, between Staten Island and New Jersey, to the westernmost end of Shooters' Island, in respect to such quarantine laws and laws relating to passengers as now exist or may hereafter be passed under the authority of that State, and for executing the same; and the said State shall also have exclusive jurisdiction for the like purposes, of and over the waters of the sound, from the westernmost end of Shooters' Island to Woodbridge Creek, as to all vessels bound to any port in the said State of New York.

"Article fifth. The State of New Jersey shall have and enjoy exclusive jurisdiction of and over all the waters of the sound between Staten Island and New Jersey, lying south of Woodbridge Creek, and of and over all the waters of Raritan Bay lying westward of a line drawn from the lighthouse at Prince's Bay to the mouth of Mattawan Creek, subject to the following rights of property and of jurisdiction of the State of New York.

"1. The State of New York shall have the exclusive right of property in and to the land under water, lying between the middle of the said waters and Staten Island.

"2. The State of New York shall have the exclusive jurisdiction of and over the wharfs, docks and improvements made and to be made, on the shore of Staten Island; and of and over all vessels aground on said shore, or fastened to any such wharf or dock,
228 except that the said vessel shall be subject to the quarantine or health laws, and laws in relation to passengers of the State of New Jersey which now exist, or which may hereafter be passed.

"3. The State of New York shall have the exclusive right of regulating the fisheries between the shore of Staten Island and the middle of the said waters, provided that the navigation of the said waters be not obstructed or hindered.

"Article sixth. Criminal process issued under the authority of the State of New Jersey, against any person accused of an offense committed within that State; or committed on board of any vessel being under the exclusive jurisdiction of that State as aforesaid; or committed against the regulations made or to be made by that State, in relation to the fisheries mentioned in the third article; and also civil process issued under the authority of the State of New Jersey against any person domiciled in that State, or against property taken out of that State to evade the laws thereof; may be served upon any of the said waters within the exclusive jurisdiction of the State of New York, unless such person or property shall be on board a vessel aground upon, or fastened to the shore of the State of New York, or fastened to a wharf adjoining thereto; or unless such person shall be under arrest, or such property shall be under seizure, by virtue of process or authority of the State of New York.

"Article seventh. Criminal process issued under the authority of the State of New York against any persons accused of an offense committed within that State; or committed on board of any vessel being under the exclusive jurisdiction of that State as aforesaid; or committed against the regulations made or to be made by that State, in relation to the fisheries mentioned in the fifth article; and also civil process issued under the authority of the State of New York, against any person domiciled in that State, or against property taken out of that State to evade the laws thereof; may be served upon any of the said waters within the exclusive jurisdiction of the State of New Jersey, unless such person or property shall be on
229 board a vessel aground upon, or fastened to the shore of the State of New Jersey, or fastened to a wharf adjoining thereto; or unless such person shall be under arrest, or such property

shall be under seizure, by virtue of process or authority of the State of New Jersey.

"Article eighth. This agreement shall become binding on the two States when confirmed by the legislatures thereof respectively, and when approved by the Congress of the United States.

"Done in four parts (two of which are retained by the Commissioners of New York, to be delivered to the Governor of that State, and the other two of which are retained by the Commissioners of New Jersey, to be delivered to the Governor of that State), at the city of New York, this sixteenth day of September, in the year of our Lord one thousand eight hundred and thirty-three, and of the independence of the United States, the fifty-eighth.

"(Signed) "B. F. BUTLER.
"PETER AUGUSTUS JAY.
"HENRY SEYMOUR.
"THEO. FRELINGHUYSEN.
"JAMES PARKER.
"LUCIUS Q. C. ELMER."

is hereby ratified and confirmed on the part of the State of New York.

EXHIBIT "C."

Chapter 48, *Laws of* 1902.

An Act to Create a Sewerage District to be Called Passaic Valley Sewerage District.

Be it enacted by the Senate and General Assembly of the State of New Jersey:

1. All that portion of Essex, Passaic, Bergen and Hudson counties beginning in the center of Newark Bay where the boundary
230 line between the cities of Newark and Elizabeth meets the boundary line between the counties of Essex and Hudson; thence running westerly along the boundary line between the city of Newark and the city of Elizabeth, running up Bound Creek to the boundary line between the township of Clinton and the city of Newark; thence running westerly between the boundary line of the city of Newark and the township of Clinton to the intersection of Clinton Place and Hawthorne avenue; thence running southerly still along said boundary line to the center of Nye avenue; thence running westerly along said center of Nye avenue to a point one hundred feet easterly from Hobson street; thence running southerly parallel to Hobson street and one hundred feet easterly therefrom to to a point two hundred feet northerly of Bragaw avenue; thence running northerly parallel with Bragaw avenue, and two hundred feet northerly therefrom to a point half way between Hobson street and Leslie street; thence running southerly half-way between said streets to the center of Bragaw avenue; thence running westerly along the center of Bragaw avenue to a point half way between Wainwright street and Schley street; thence running northerly half way between

said streets to a point three hundred feet northerly from Bragaw avenue; thence running westerly parallel to Bragaw avenue and three hundred feet northerly therefrom, and in a westerly prolongation of said line, to a point half way between Schley street and Fabyan Place; thence running northerly half way between Schley street and Fabyan Place to the center of Nye avenue; thence running westerly along the center of Nye avenue to the boundary line between the city of Newark and the town of Irvington; thence running northerly along said boundary line between Newark and Irvington to a point one hundred feet south of Avon avenue; thence running easterly parallel to Avon avenue, and one hundred feet southerly therefrom, to a point half way between South Twentieth street and South Nineteenth street; thence running northerly half way
231 between said streets to a point one hundred feet northerly of Woodland avenue; thence running easterly parallel to Woodland avenue and one hundred feet northerly therefrom, to a point half way between South Nineteenth and South Eighteenth street; thence running north-ly half way between said streets to a point one hundred feet southerly of Eighteenth avenue; thence running easterly parallel with said Eighteenth avenue, and one hundred feet southerly therefrom, to a point half way between Eighteenth street and Seventeenth street; thence running northerly half way between said streets to a point two hundred feet northerly from Eighteenth avenue; thence running easterly parallel to Eighteenth avenue and two hundred feet northerly therefrom, to a point one hundred feet easterly from Seventeenth street; thence running northerly parallel to Seventeenth street, and one hundred feet easterly therefrom to a point two hundred feet southerly from Fifteenth avenue, and two hundred feet southerly therefrom, to a point half way between Sixteenth street and Fifteenth street; thence running northerly half way between Sixteenth street and Fifteenth street to a point one hundred feet northerly from Fourteenth street; thence running easterly parallel with Fourteenth avenue, and one hundred feet northerly therefrom, to a point half way between Fifteenth street and Fourteenth street; thence running northerly half way between said streets to a point three hundred feet northerly from Fourteenth avenue; thence running easterly and parallel with Fourteenth avenue and three hundred feet northerly therefrom, to a point one hundred feet westerly from Ashland avenue; thence running northerly parallel with Ashland avenue and one hundred feet westerly therefrom to the north side of South Orange avenue; thence running westerly along said north side of South Orange avenue to the east side of South Eighteenth street; thence running northerly along said east side of South Eighteenth street to a point in range of a line half way
232 between Twelfth avenue and Thirteenth avenue; thence running westerly half way between said avenue to a point half way between South Nineteenth and South Twentieth streets; thence running southerly half way between said streets to a point one hundred feet northerly from Thirteenth avenue; thence running westerly parallel to Thirteenth avenue, and one hundred feet north-

erly therefrom, to the boundary line between the city of Newark and the borough of Vailsburgh; thence running northerly along said boundary line between the city of Newark and the borough of Vailsburgh to the boundary line between the city of East Orange and the borough of Vailsburgh; thence westerly along the boundary line between the city of East Orange and the borough of Vailsburgh to an angle therein; thence running southerly still along said boundary line to another angle in said line in South Orange avenue; thence running westerly still along said boundary line and South Orange avenue to a third angle; thence running northerly still along said boundary line to a fourth angle; thence running westerly still along said boundary line between the city of East Orange and the borough of Vailsburgh and the boundary line between the city of East Orange and the village of South Orange to a point in the boundary line between the city of Orange and the village of South Orange; thence running westerly along said boundary line between the city of Orange and the village of South Orange to the boundary line of the town of West Orange; thence running northerly along the boundary line between the town of West Orange and the city of Orange to the boundary line of the town of Montclair; thence westerly along the boundary line between the town of West Orange and the town of Montclair to an angle; thence running northerly further along said boundary line between West Orange and Montclair to the boundary line of the township of Verona; thence running northerly along the boundary line between Verona and Montclair to the boundary
233 line of the township of Little Falls; thence running easterly along the boundary line between the township of Little Falls and the town of Montclair to the boundary line of the township of Acquackanonek; thence running northerly along the boundary line between the township of Little Falls and Acquackanonek township to the southerly boundary of the city of Paterson; thence northwesterly along the same to a point in the Passaic River where the said southerly boundary line of the city of Paterson would intersect the dividing line between the city of Paterson and Totowa borough; thence northwesterly along said dividing line to the northwesterly boundary line of the city of Paterson; thence following the various courses of the northerly boundary line of the city of Paterson to the center of the Passaic River; thence along the center of said river to the northerly boundary line of the borough of Garfield; thence easterly and southerly along the several courses of the boundary line of the borough of Garfield to a point where said boundary line is intercepted by the northeasterly corner of the boundary line of the borough of Wallington; thence southerly along the easterly boundary line of the borough of Wallington to Hoboken street on the boundary line between the boroughs of Wallington and East Rutheford; thence southwesterly along said line to a point where Hoboken street is intersected by Montross avenue; thence southwesterly along the center of Montross avenue to the boundary line between the boroughs of East Rutheford and Rutheford; thence southwesterly along the center of Montross avenue to the center of Washington avenue; thence northwesterly along the center of Washington avenue to

Prospect Place; thence southwesterly along the center of Prospect Place to Union avenue; thence southwesterly in prolongation of the line of the center of Prospect Place and parallel to Carmita avenue to a point where said line would be intersected by the center line of Fairview avenue if prolonged northwesterly; thence southeasterly to the easterly side of Montrose avenue; thence southerly along
234 the center of Fairview avenue three hundred and fifty feet; thence southwesterly parallel to the center line of Montrose avenue to the center line of Passaic avenue; thence southerly in a straight line to a point two hundred and fifty feet westerly from Mortimer avenue midway between Donaldson and Woodland avenues; thence southeasterly parallel to Donaldson avenue to the center of Mortimer avenue; thence southerly along the center line of Mortimer avenue to the center of Park Place; thence easterly along the center of Park Place to the intersection of Park Place and Wheaton Place; thence southwesterly along the center of Wheaton avenue to the center line of Pierrepont avenue; thence southeasterly along the center of Pierrepont avenue to its intersection with the center line of Ridge avenue; thence southwesterly along said Ridge avenue to the center line of Woodland avenue; thence southeasterly along the center of Woodland avenue to the center line of Sylvan street; thence southwesterly along the center of Sylvan street to the center line of Van Riper avenue; thence southerly in a straight line to the intersection of the center lines of Summit and Rutherford avenues in the boundary line between the borough of Rutherford and the township of Union; thence southwesterly in a straight line to the intersection of the center line of Cromwell and Kingsland avenues; thence southwesterly along the said line of Cromwell avenue to Jauncey avenue in the borough of North Arlington; thence still southwesterly along the center of Cromwell avenue to a point one hundred feet northerly of the Jersey City and Belleville Turnpike; thence running southeasterly parallel with said turnpike and one hundred feet northeasterly therefrom, to a point measuring southeasterly along said line five thousand feet southeasterly from its intersection with the center line of the New York and Greenwood Lake Railroad; thence running southerly to a point in the Newark plank road, which point is one thousand eight hundred and fifty feet measuring easterly
235 along said plank road from the center of the draw on said road over the Passaic River; thence running southerly to a point on the Newark and New York Railroad, which point is one thousand eight hundred and fifty feet, measuring easterly along said railroad, from the center of the draw over the Passaic River on said railroad; thence running southerly in a prolongation of said last described course to its intersection with the easterly boundary of the city of Newark in Newark Bay; thence running southerly along said boundary of the city of Newark to the point of beginning, shall be and is hereby constituted a sewerage district under the name and title of Passaic Valley Sewerage District, and it shall be entitled to all of the authority and shall be subject to all the laws of this State concerning sewerage districts so created.

2. This act shall take effect immediately.

Approved March 27, 1902.

EXHIBIT "D."

Chapter 10, *Laws of* 1907.

An act to provide for the purification of the waters of the Passaic River within the Passaic Valley Sewerage District, prohibiting the discharge of sewage or other polluting matter into said portion of said river after a fixed date, and authorizing municipalities lying in whole or in part within the Passaic Valley Sewerage District, from the territory of which sewage or other polluting matter is or may be discharged into said portion of said river, to enter into contract with each other and with the Passaic Valley Sewerage Commissioners for the intercepting and disposal of such sewage and other polluting matter, and to provide the necessary funds therefor.

Whereas, a large number of municipalities and the inhabitants thereof are now discharging sewage and other polluting
236 matter into the waters of the Passaic River within the Passaic Valley Sewerage District, between the Great Falls at the city of Paterson and the mouth of the Passaic River at Newark Bay and said waters are thereby polluted; and

Whereas, in order to purify said portion of said river, it is necessary that power be granted to said municipalities to adopt some method to prevent the discharge of sewage and other polluting matter into said portion of said river by mutual co-operation, and that a reasonable time be granted within which to provide the necessary means for intercepting and disposing of said sewage and other polluting matter.

Be it enacted by the Senate and General Assembly of the State of New Jersey:

1. Every municipality, corporation and individual is hereby prohibited and forbidden to discharge, directly or indirectly, any sewage or other polluting matter into the waters of the Passaic River at any point between the Great Falls in the city of Paterson and the mouth of the said river at Newark Bay, or into any tributaries of the Passaic River which empty into the Passaic River between said points, after the twelfth day of December, in the year one thousand nine hundred and twelve; and the Passaic Valley Sewerage Commissioners are hereby authorized and empowered to enforce the provisions of this act over and throughout all municipalities which may, or the inhabitants of which may, directly or indirectly, discharge sewage or other polluting matter into the waters of the Passaic River between the points above designated, or into the tributaries aforesaid, after the said twelfth day of December, one thousand nine hundred and twelve.

The Passaic Valley Sewerage Commissioners are hereby authorized and directed, within thirty days after the approval of this act, to notify each municipality from which sewage or other pol-
237 luting matter is or may be discharged into the said river between said points, either directly or indirectly, and the in-

habitants thereof, that the discharge of sewage and other polluting matter into the waters of said river must be discontinued on or before the twelfth day of December, in the year one thousand nine hundred and twelve. Such notice shall be in writing, signed by the president and secretary of the Passaic Valley Sewerage Commissioners, and shall be served upon the clerk or the equivalent officer of every such municipality, and shall be published in one of the newspapers printed and circulating in the counties of Passaic, Bergen, Hudson and Essex, for two consecutive weeks, once in each week, such public notice to be in the following form:

To whom it may concern:

Public notice is hereby given that the discharge of sewage and other polluting matter into the waters of the Passaic River at any point between the Great Falls, at the city of Paterson, and Newark Bay, and into the tributaries of the said river emptying therein between said points, is prohibited and must cease and be discontinued after December twelfth, in the year one thousand nine hundred and twelve.

The Passaic Valley Sewerage Commissioners are further authorized and empowered to institute in their corporate name suits at law or in equity, as may be deemed necessary or appropriate to enforce the provisions of this section of the act after said twelfth day of December, in the year one thousand nine hundred and twelve; and the court of chancery of this State is hereby vested with special jurisdiction to enforce the provisions of this section of this act in a summary manner upon application of the Passaic Valley Sewerage Commissioners.

2. The governing body or board having charge of finances of any municipality or municipalities, lying in whole or in part within the Passaic Valley Sewerage District may, by resolution, determine that it is advisable and to the interest of such municipality
228 or municipalities, in order to comply with the provisions of this act, to cause the sewage and other polluting matter discharging or which may be discharged into the waters of the Passaic River, from its or their territory, within the Passaic Valley Sewerage District, to be intercepted by a trunk or main intercepting sewer or sewers, and to be conducted to a safe and proper place for discharge and disposal, and there to be discharged and disposed of; and may further, by said resolution, request the Passaic Valley Sewerage Commissioners to prepare and submit maps, plans and specifications for the construction of a joint trunk or main intercepting sewer or sewers, and of the necessary works for the discharge and disposal of sewage and other polluting matter, at some safe and proper place or places, together with an estimate of the probable cost of such construction and of the operation and maintenance thereof, and of obtaining the necessary property rights for the construction thereof, and also an estimate of the sewage capacity in said trunk sewer or sewers required by each municipality lying in whole or in part within said sewage district. Also, an estimate of the proportion of said cost of construction, as near as

may be, which would be apportioned to each of said municipalities upon the basis expressed in section four of this act. The municipality making such request shall, in and by said resolution, agree to pay the said Passaic Valley Sewerage Commissioners the cost, not exceeding ten thousand dollars ($10,000), of preparing such maps, plans, specifications and estimate so requested.

And such municipality shall, at the time of making such request, pay as part of said expenses the sum of five thousand dollars ($5,000) to the Passaic Valley Sewerage Commissioners, which said moneys the said municipality is authorized to appropriate and pay from any fund or balance not otherwise appropriated; and it is also further anthorized to raise by temporary loans, notes, or bonds, said sums so to be advanced and paid by said municipality, which
239 shall be repaid to it, with interest at the rate of five per centum per annum, when contract, as hereinafter provided, shall have been entered into for the building of said sewer, sewers, plant, or works.

3. Upon receiving a copy of such resolution or resolutions authenticated by the clerk or other like officer of any one or more of such municipalities, the Passaic Valley Sewerage Commissioners shall forthwith prepare the said maps, plans, and specifications and estimates so requested, and copies thereof shall be delivered by the clerk of the Passaic Valley Sewerage Commissioners to each of the clerks or other like officers of all the municipalities lying in whole or in part within the Passaic Valley Sewerage District.

An accurate record of the time and manner of the delivering of said copies by the clerk of the Passaic Valley Sewerage Commissioners to the clerks of said municipalities shall be made by the clerk of the Passaic Valley Sewerage Commissioners, and entered upon the minutes of said boards, and a like record shall be kept by the clerks of the said municipalities and shall be entered upon the minutes of the boards or bodies having charge of the finances in said municipalities respectively.

In preparing the maps, plans, and specifications for the intercepting sewer or sewers, plant or works, to be made by the said commissioners as herein provided, and in making the estimate of the sewage capacity required for each municipality, regard shall be had by the said commissioners both to the area and population to be provided for, making provision, however, for not more than ten per centum of the factory waste and excluding all waste from gas works, and all substances or discharges which may injuriously affect the integrity of the sewer or sewers when constructed.

4. Any two or more of said municipalities, at any time after the expiration of three months from the date of the said delivery of copies of said maps, plans, specifications and estimates to all
240 of the said municipalities lying in whole or in part within the said sewerage district, are hereby authorized and empowered, by resolution of their governing bodies or boards having charge of their finances, to enter into a contract in writing with each other and with the Passaic Valley Sewerage Commissioners, in their corporate capacities, for the construction, maintenance and operation

of said sewer or sewers, plant or works, with the appurtenances or of so much thereof as may be necessary and appropriate for the contracting municipalities, together with works, machinery, appliances and other things requisite or useful for the purposes to be accomplished by such intercepting sewer or sewers, and for the purchase of lands, rights in lands and other property requisite or useful therefor.

The contract herein authorized shall generally describe the route, line, size and capacity of such intercepting sewer or sewers, and shall fix the percentage of the capacity therein, to the use of which each of the contracting municipalities shall be entitled, together with the percentage of the cost and expense of construction, repair, maintenance and operation of the same to be paid by each of the contracting municipalities. The cost of the construction of said sewer or sewers, plant and works shall in said contract be apportioned to the respective municipalities entering into the contract in such proportion as the taxable property, real and personal, within so much of said municipality so contracting as is embraced in said sewerage district, bears to the total amount of taxable property, real and personal, within so much of all of the municipalities so contracting as is embraced within said sewerage district, as returned and certified by the respective taxing boards and taxing officers of the said municipalities for the year one thousand nine hundred and seven.

Provided, however, That all taxable property, real and personal, for this purpose, be assessed at its true value and it shall be the duty of each assessor, taxing board and taxing officer, for the several municipalities so contracting, for this purpose to examine, compute and determine, and certify to the said sewerage board on or before the first day of October, one thousand nine hundred and seven the amount of taxable property, real and personal, assessed for the year one thousand nine hundred and seven, to and upon persons and property within so much of the several municipalities so contracting as lie within the said sewerage district; and the books of each of said assessors, taxing boards and taxing officers shall at all times be open for examination to the Board of Sewerage Commissioners and to the contracting municipalities, its and their officers and agents, for the purpose of examining, checking and verifying said certificates.

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In case any contracting municipality shall request sewage capacity in excess of what would be allotted to it for sewage, including ten per centum of factory waste, provision may in said contract be made for the enlargement of said sewer or sewers, plant and works, in order to accommodate, take care and dispose of a large quantity of factory waste, such increase in accommodation to be made at the expense of the municipality making requisition therefor.

The cost of maintenance, repair and operation of said sewer or sewers, plant and works shall, by the terms of said contract, be apportioned annually to the respective municipalities entering into said contract, according to the amount of sewage by them respectively delivered or discharged into any sewer or sewers or other re-

ceptacle provided or constructed by the said sewerage commissioners for the reception of the same.

The said contract shall provide for the construction by the Passaic Valley Sewerage Commissioners of an intercepting sewer or sewers, plant and works, reasonably sufficient in size and capacity to intercept and dispose of sewage and other polluting matter of the contracting municipalities for the present, and, so far as can be estimated and foreseen, for the future, and said sewer or sewers, plant and works may differ substantially in details from the
242 preliminary maps, plans, specifications and estimates submitted to the municipalities as hereinbefore directed.

And the several contracting municipalities and the Passaic Valley Sewerage Commissioners are hereby vested with absolute discretion in the determination of the size and capacity of such intercepting sewer or sewers, plant and works.

Any contract made or entered into pursuant to the provisions of this act shall provide for the building, repairing, operating, maintaining and cleaning of any such intercepting sewer or sewers, plant and works, and for the purchase of the necessary lands, rights in land and other property by the Passaic Valley Sewerage Commissioners, and for the payment of the cost and expense thereof by the several contracting municipalities to the said commissioners.

The total cost and expense of constructing said intercepting sewer or sewers, plant and works, shall include as a part thereof the expenses of the Passaic Valley Sewerage Commissioners heretofore incurred and not otherwise provided for, not exceeding the sum of twenty-five thousand dollars ($25,000), also the cost of preliminary maps, plans, specifications and estimates herein referred to; also, the salary or other compensation of the said commissioners up to the completion of said intercepting sewer or sewers, plant and works, together with all incidental expenses of maintaining their corporate organization and clerical and engineering services, and the reasonable compensation of counsel which they are hereby authorized to employ.

The cost and expense of maintaining, repairing and operating said intercepting sewer or sewers, works and plant, shall include as a part thereof the salaries or other compensation of the said commissioners, also charges for clerical and engineering services, compensation of counsel and incidental expenses of maintaining their corporate organization.

In all the contracts to be made between the municipalities and the Passaic Valley Sewerage Commissioners pursuant to the
243 terms of this act, the several municipalities so contracting shall undertake and agree upon the request of the Passaic Valley Sewerage Commissioners to exercise and put in operation all their powers of eminent domain for the condemnation of lands, rights in lands and other property for the benefit of such joint enterprise, either within or outside the territory of such contracting municipalities.

Upon the making of the contract hereby authorized the Passaic Valley Sewerage Commissioners shall have full power in their own

corporate name to purchase and acquire all lands, rights and interests in lands, either within or outside the territory of the joint contracting municipalities, which may be necessary for the construction of such intercepting sewer or sewers, and its appurtenances, and for this purpose are authorized to condemn the same in the manner provided by the general laws of this State relating to the condemnation of lands for public use.

Upon the making of such contract the Passaic Valley Sewerage Commissioners are further authorized and empowered to erect, construct, maintain, and operate such intercepting sewer or sewers and appurtenances, together with all works, machinery, appliances, and other things requisite or useful for the purposes to be accomplished by the same.

It shall be lawful for the Passaic Valley Sewerage Commissioners, in the execution of said works, to build and construct said intercepting sewer or sewers and the necessary appurtenances thereto, to the point or points of discharge and disposal determined by said contract, and for this purpose to pass through or partly through territory situated within the bounds of any other municipality than those contracting with it for the construction of said work, and they shall have full power to construct such intercepting sewer or sewers, and its appurtenances, along, under, and over any water-course, or under or over or along or across any street, turnpike, road, railroad, highway or other way, or public park or grounds, and in or
244 upon private or public land under water; in such way and manner, however, as not necessarily to obstruct or impede travel or navigation, and may enter upon and dig up any street, highway or private or public land, for the purpose of constructing said work and appurtenances and for repairing and maintaining the same, and in a general way to do all other acts and things necessary, convenient, and proper in connection with the making and maintaining of the improvement contemplated by the provisions of this act. The highways dug up and disturbed shall be restored to their former condition as near as may be.

Whenever any work to be performed or material to be furnished shall involve an expenditure of any sum of money exceeding the sum of two thousand dollars ($2,000) the Passaic Valley Sewerage Commissioners shall designate the time when they will meet at their usual place of meeting to receive proposals in writing for doing the work and furnishing the material; and said commissioners shall order their clerk to give notice by advertisement inserted in at least two newspapers printed and circulating, respectively, in two of the counties of said district, at least ten days before the time of such meeting, of the work to be done and material to be furnished, of which at the time of such order they shall cause to be filed in their office particular specifications.

All proposals received shall be publicly opened by the said commissioners and the commissioners shall award the contract to the lowest responsible bidder; all contractors shall be required to give bond satisfactory in amount and security to the Passaic Valley Sewerage Commissioners.

6. For the purpose of defraying the cost and expense of the construction of such intercepting sewer or sewers, plant and works, and appurtenances, and of making the payments which shall be designated and required to be made by such joint contract, the governing body or board in charge of the finances of each contracting municipality is hereby authorized and empowered to borrow the money necessary to make such payments upon the notes or other temporary obligations of such municipality, which notes or obligations may be renewed from time to time, until permanent bonds shall have been issued by such municipality to take up and pay for the same.

And each contracting municipality shall have the power and is hereby authorized, from time to time to issue its bonds for the purpose of raising money necessary to pay its notes or other temporary obligations including interest, issued and outstanding for the purpose hereinbefore stated, or to make any of the payments required by the said contract, which said bonds shall be in such amounts and bear interest at such rate, not exceeding six per centum per annum, and shall be payable at such time and place as the governing body or board having charge of the finances of such municipality shall by resolution, duly adopted, determine.

The total amount of indebtedness incurred and of bonds issued by any municipality under the authority of this act shall not exceed five per centum of the tax ratables within such municipality, as shown by its official books of the last assessment for taxes therein, but said indebtedness and bonds shall be held to be authorized in addition to the amount of indebtedness and bonds fixed by the charter or general act as a limitation beyond which such municipality may not incur indebtedness or issue bonds, and said indebtedness and bonds authorized by this act shall not be taken to be included within or governed by any such limitation.

Upon the making of any such contract as is herein provided for the Passaic Valley Sewerage Commissioners are authorized and empowered to borrow upon their corporate notes, or other temporary obligations, any moneys which may be required by them in the performance of the said contract, for the payment of which moneys so borrowed said contract with the several municipalities executing the same shall be security.

8. Any time after the making of a contract in accordance with the provisions hereof, the Passaic Valley Sewerage Commissioners may, with the consent of the municipalities which have contracted with them, enter into further contract or contracts, with any other municipality, or person or corporation, for the use of the said intercepting sewer or sewers and appurtenances, and for participation in the benefits and in the cost of construction, operation and maintenance of the same, upon such terms and conditions as may be agreed upon in any such contract or contracts.

And the said last-mentioned municipality or municipalities shall have like power to borrow money, make and issue notes or other temporary obligations and bonds as is given by this act to the munici-

palities first entering into contract with the Passaic Valley Sewerage Commissioners.

9. Upon the completion of such intercepting sewer or sewers, plant and works, and appurtenances, the Passaic Valley Sewerage Commissioners are authorized and directed to retain and have the sole control and charge of the said sewer or sewers, plant and works, and appurtenances and every municipality using such intercepting sewer or sewers, plant and works, is hereby required to pay annually to the Passaic Valley Sewerage Commissioners, on demand, its proportion of the cost of maintenance and operation of the same, as the same may be certified to it from time to time by the Passaic Valley Sewerage Commissioners, pursuant to the terms of said contract, which said cost of maintenance and operation shall be raised and provided for by the said municipalities by taxation or by the issue of temporary loan bonds in anticipation of taxation.

In case the sewer or sewers, plant or works, first contracted to be built under this act shall not be built and put in practical operation by the twelfth day of December, one thousand nine hundred and ten, then and in that case the municipalities lying in whole or in part within the Passaic Valley Sewerage District, and not entering
247 into contract with the Passaic Valley Sewerage Commissioners for the construction of an intercepting sewer or sewers, plant or works under this act, shall have two years from the time within which such sewer or sewers shall be put into practical operation within which to cease to discharge all sewage and other polluting matter into the said portion of the said river.

It shall be the duty of the Comptroller of this State to cause the accounts of the Passaic Valley Sewerage Commissioners to be annually audited at the expense of the Passaic Valley Sewerage Commissioners, and the result of such audit shall be printed with the financial report of the Passaic Valley Sewerage Commissioners. The said Board of Sewerage Commissioners shall at all times keep full and accurate account of its receipts and expenditures and liabilities, and shall annually cause a detailed statement thereof to be published and a copy thereof mailed to the clerk of each of the contracting municipalities. Said commissioners shall be liable for any unlawful act, as are now members or officers of any public body, and no commissioner shall be, directly or indirectly, interested in any contract awarded under the provisions of this act, or in furnishing material, or supplies therefor to any contractor, or in furnishing security for the performance of any contract.

In case the city of Paterson shall, pursuant to the provisions of this act, enter into contract with the Passaic Valley Sewerage Commissioners for the construction of an intercepting sewer or sewers, plant and works and appurtenances, then and in that case the said city shall turn over to the Passaic Valley Sewerage Commissioners all plans, maps, data and reports which it may have produced, purchased or secured, and which it may now own relating to the subject of sewerage and sewage disposal, and the Passaic Valley Sewerage Commissioners shall credit to the city of Paterson therefor on said contract the sum of eight thousand dollars ($8,000), and the

said sum shall be taken to be a part of the construction cost of said sewer or sewers, plant and works.

248 10. In case, for any reason, any section or provision of this act shall be questioned in any court, and shall be held to be unconstitutional or invalid, the same shall not be held to affect any other section or provision of this act.

11. For the purpose of removing any doubt which may exist as to the corporate power and authority of the Passaic Valley Sewerage Commissioners to enter into and perform the contracts herein and hereby authorized, and to execute and perform the duties herein imposed upon the said commissioners, the said Passaic Valley Sewerage Commissioners heretofore appointed and their successors in office, are and shall continue to be a body politic and corporate, with perpetual succession under the name of Passaic Valley Sewerage Commissioners, with power to sue and be sued, with power to adopt and use a corporate seal, and with the right, power and authority to acquire, hold, use and dispose of all such property, real or personal, as may be proper or necessary, and with all other power or authority proper or necessary to carry out and effectuate the purposes for which the said board is created.

12. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

13. This act shall take effect immediately.

Approved March 18, 1907.

[Endorsed:] No. 5, Original. Supreme Court of the U. S., October term, 1910. The People of the State of New York, complainants, against The State of New Jersey and Passaic Valley Sewerage Commissioners, defendants; The City of New York, intervenor. Petition of intervention on behalf of the City of New York. Archibald R. Watson, Corporation Counsel, Hall of Records, Borough of Manhattan, New York city.

249 (Endorsed:) Supreme Court of the United States, October Term, 1910. No. 5, Original. The People of the State of New York, Complainants, vs. The State of New Jersey and Passaic Valley Sewerage Commissioners. Motion and notice on behalf of the City of New York for Leave to Intervene and Petition of Intervention. Filed —.

250 And afterwards, towit, on the 19th day of December, A. D. 1910, the following entry appears of record, viz:

5, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainant-,
vs.
STATE OF NEW JERSEY et al.

On consideration of the motion for leave to the City of New York to intervene in this cause, it is now here ordered by the Court that said motion be, and the same is hereby, denied.

December 19, 1910.

251 And afterwards, towit, on the 10th day of April, A. D. 1911, the following entry appears of record, viz:

5, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY et al.

The motion for the appointment of a Commissioner to take the testimony herein and for an order fixing the time for taking such testimony was submitted to the consideration of the Court on printed briefs by Mr. Maurice B. Dean, of counsel for the complainants in support of the motion, and Mr. Edmund Wilson, Mr. Joseph Coult and Mr. Robert H. McCarter, of counsel for the defendants in opposition thereto.
April 10, 1911.

Which said motion is in the words and figures following, viz:

252 Supreme Court of the United States, October Term, 1910.

No. 5, riginal. In Equity.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

1. Notice of Motion on Behalf of the Complainants, the People of the State of New York, for the Appointment of a Commissioner and for Fixing a Time for the Taking of Testimony;
2. Motion on Behalf of the Complainants, the People of the State of New York, for the Appointment of a Commissioner and Fixing a Time for the Taking of Testimony.

THOMAS CARMODY,
Attorney General of the State of New York.

MAURICE B. DEAN,
Special Counsel for the Complainants.

Service of a copy admitted this 24th day of March 1911.

JOSEPH COULT,
ROBT. H. McCARTER,
Of Counsel for State of N. J.

253 In the Supreme Court of the United States, October Term, 1910.

In Equity. No. 5. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

To the State of New Jersey and the Passaic Valley Sewerage Commissioners, Defendants:

You will please take notice that the complainants herein, the People of the State of New York, by their counsel, will move the above Court on Monday, April 3, 1911, for the appointment of a commissioner to take testimony, fixing the rate of his compensation and payment of his disbursements and setting the time and circumstances under which the testimony in this case shall be taken.

THOMAS CARMODY,
Attorney General of the State of New York.
MAURICE B. DEAN,
Special Counsel.

No. 20 Broad Street, New York City.

254 In the Supreme Court of the United States, October Term, 1910.

In Equity. No. 5. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Motion on Behalf of the Complainants, the People of the State of New York, for the Appointment of a Commissioner and Fixing a Time for the Taking of Testimony.

To the Honorable the Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

Come now the People of the State of New York, by Maurice B. Dean, their counsel, and move the Court as follows:

First. That this Court appoint a commissioner to take the testimony in this case and to report the same to the Court without findings of fact or conclusions of law; that the commissioner shall be allowed not to exceed twenty dollars per diem for his compensation, together with his actual travelling and reasonable hotel ex-
254½ penses, an itemized statement of which shall be submitted to the Court in his final report, that he shall report to the Court a

stenographic copy of the testimony taken before him; that payment of compensation and expenses be made in such manner as the Court may direct.

Second. That the complainants may take testimony at such place as they may indicate, between the first day of June, 1911, and the first day of October, 1911, upon giving ten days' notice of the time and place of taking testimony to the counsel for the defendants.

Third. That the defendants may take testimony at such place as they may indicate, between the first day of October, 1911, and the first of January, 1912, upon giving ten days' notice of the time and place of taking such testimony to the counsel for the complainants herein.

Fourth. That the complainants may take testimony in rebuttal between the first day of January, 1912, and the first day of February, 1912, at such time and place as they may indicate, upon giving ten days' notice to the counsel for the defendants.

Fifth. The defendants shall then conclude the taking of any further testimony on or before March 1, 1912, upon giving ten days' notice of the time and place of taking such testimony to the counsel for the complainant.

Sixth. That the above set forth times designated for taking testimony may be varied upon consent of counsel for the respective parties, which shall have the same effect as an order made by this court when entered upon the record before the commissioner;
255 but the time for concluding the testimony shall not be extended without the further order of this court.

THOMAS CARMODY,
Attorney General of the State of New York.
MAURICE B. DEAN,
Special Counsel for the Complainants.

No. 20 Broad Street, New York City.

256 (Endorsed:) Supreme Court of the United States, October Term, 1910. No. 5, Original. The People of the State of New York, Complainants, vs. State of New Jersey et al. Motion of Complainants for the Appointment of a Commissioner to take testimony and to fix time for taking testimony, notice and proof of service of same. Thomas Carmody. Filed Apr. 10. 1911.

257 And on the same day, towit, on the 10th day of April A. D. 1911, opposition to foregoing motion was filed in words and figures, following, viz:

In the Supreme Court of the United States, October Term, 1910.

In Equity. No. 5, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY AND PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Opposition of the Defendants to the Motion on Behalf of Complainant, the People of the State of New York, for Appointment of a Commissioner, and Fixing the Time of Taking of Testimony.

To the Honorable the Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

Come now the State of New Jersey by Robert H. McCarter, its counsel, and Passaic Valley Sewerage Commissioners by Joseph Coult, its counsel, in response to the motion of the State of New York to appoint a commissioner and fix a time for the taking of testimony, and say:

First. That this court by its order appointing a commissioner authorize him to employ a competent stenographer residing
258 within the State of New Jersey or the State of New York, to report the proceedings before the said commissioner, and in such order require the commissioner to furnish carbon copies of the testimony to the respective parties.

Second. That the complainants' time for taking testimony be limited to two months from the date of the entry of the order appointing the commissioner, and that the said testimony shall be taken at some place either within the State of New York or within the State of New Jersey, upon ten days' notice of the time and place of taking testimony to the counsel of the defendants, and that the commissioner be given power to adjourn the hearings.

Third. That the defendants may take testimony at such place as they may indicate within the State of New Jersey or the city of New York, within two months from the date on which they shall receive written notice from the complainants that they have closed their case, but the time from the first day of July, 1911, to the fifth day of September, 1911, shall be excepted in the computation of said two months, and the defendants shall notify the complainants by written notice that they have closed their case.

Fourth. That the complainants shall conclude the taking of any further testimony within one month from the time they shall receive notice in writing from the defendants that they have concluded their testimony.

Fifth. The defendants shall then conclude the testimony within twenty days from the date when the complainants shall conclude their rebuttal testimony.

Sixth. That the above set forth time designated for taking testi-

mony and the period of notice to be given of the taking
259 thereof may be varied upon the written stipulation of counsel for the respective parties, which, when entered upon the record before the Commissioner, shall have the effect of an order made by this court, but the time for concluding the testimony shall not be extended beyond the fifth day of December, 1911, without the further order of this court.

Seventh. That either party may apply to this court, on ten days' notice, after the concluding of the taking of testimony in this case or within ten days after the fifth day of December, 1911, to fix a time for the final argument of the cause.

EDMUND WILSON,
Attorney-General of the State of New Jersey.

JOSEPH COULT,
ROBERT H. McCARTER,
Special Counsel for the Defendants,
763 Broad Street, Newark, N. J.

(Endorsed:) Supreme Court U. S. October Term, 1910. No. 5, Orig'l. The People of the State of New York, Complainants, vs. State of New Jersey et al. Response of defendants to motion for appointment of Commissioner & to fix time for taking testimony. Filed April 10, 1911.

260 In the Supreme Court of the United States, October Term, 1910.

In Equity. No. 5, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Supplementary Paper to Opposition of the Defendants to the Motion on Behalf of Complainant, The People of the State of New York, for Appointment of a Commissioner, and Fixing the Time of Taking Testimony.

To the Honorable the Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

Come now the State of New Jersey by Edmund Wilson,
261 Attorney General of the State of New Jersey, and Robert H. McCarter, its special counsel, and Passaic Valley Sewerage Commissioners, by Joseph Coult, its counsel, supplementary as aforesaid to the response to the motion of the State of New York to appoint a commission and fix a time for the taking of testimony, and say:

First. That it is respectfully suggested that the appointment by

this honorable court, as said commissioner, of Francis Rawle, Esq., formerly president of the American Bar Association, a gentleman of the highest character, would be in the opinion of the defendants appropriate and satisfactory.

Second. That in opposition to the motion for the appointment of a commissioner by the complainants as set forth in the statement filed by the defendants, to which this paper is supplementary, the defendants desire to call to the attention of this court that while no injunction or restraining order is in force in this cause, that the pendency of this suit has effectually put a stop to the engineering work contemplated by the said defendants, and that great injury by delay will arise to the said defendants because of any unnecessary stoppage of the sanitary measure sought to be effectuated, and the defendants therefore pray that the application of the complainant, The People of the State of New York, be modified to the reasonable and
262 ample time suggested to this honorable court in accordance with the objections made thereto by the defendants, The State of New Jersey and Passaic Valley Sewerage Commissioners.

EDMUND WILSON,
Attorney General of New Jersey.
ROBERT H. McCARTER,
Special Counsel of Defendants,
763 Board St., Newark, N. J.
JOSEPH COULT,
Special Counsel of Defendants,
Newark, N. J.

(Endorsed:) Supreme Court U. S. October Term, 1910. No. 5, Original. The People of the State of New York, Complainants, vs. State of New Jersey et al. Supplemental Response of defendants to motion for appointment of Commissioner and to fix time for taking testimony. Filed April 10, 1911.

263 And on the same day to wit on the 10th day of April A. D. 1911, the following Stipulation was filed, viz:

Supreme Court of the United States.

No. 5, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

On Bill, &c.

Notice that a motion will be made on behalf of the Complainants on Monday, the Third day of April, One Thousand Nine Hundred and Eleven, for the appointment of a Commissioner and for fixing

the time for taking testimony in the above stated cause, having been given:

It is hereby stipulated and agreed, that the time at which the said motion will be made is hereby extended to Monday, the Tenth day of April, one Thousand Nine Hundred and Eleven.

Dated, March 30, 1911.

JOSEPH COULT,
Counsel with Def'ts.
MAURICE B. DEAN,
Counsel for Complainants.
ROBERT H. McCARTER,
Special Counsel for N. J.

Endorsed: No. 5 Original, Supreme Court of the United States. The People of the State of New York, Complainants, vs. The State of New Jersey and Passaic Valley Sewerage Commissioners, Defendants, *Defendants.* On Bill, &c. Stipulation. Joseph Coult, of counsel with Passaic Valley Sewerage Commissioners.

264 Endorsed: Supreme Court U. S. October Term, 1910. Term No. 6 Original. The People of the State of New York, Complainants vs. State of New Jersey et al. Stipulation extending time for submission of motion for appointment of Commissioner and to fix time for taking testimony. Filed April 10, 1911.

265 And afterwards, to wit, on the 24th day of April, A. D. 1911, the following entry appears of record, viz:

5. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS.

On consideration of the motion of the Complainants for the appointment of a commissioner to take testimony in this cause and to fix the time for taking such testimony, and of the opposition of counsel for the defendants thereto. It is now here ordered by the Court that Mr. James D. Maher, of the District of Columbia, be, and he is hereby appointed a Commissioner to take and return the testimony in this cause, with the powers of a master in chancery, as provided in the rules of this Court; but said Commissioner shall not make any findings of fact or state any conclusions of law. It is further ordered that the complainants may take testimony at such place as they may indicate, between the first day of June, 1911, and the first day of October, 1911, upon giving ten days' notice of the time and place of taking testimony to the counsel for the defendants. That the defendants may take testimony at such place as they may indicate, between the first day of October, 1911, and the first day of January, 1912, upon giving ten days' notice of the time

and place of taking such testimony to the counsel for the complainants herein. That the complainants may take testimony in
266 rebuttal between the first day of January, 1912, and the first day of February, 1912, at such time and place as they may indicate, upon giving ten days' notice to the counsel for the defendants. The defendants shall then conclude the taking of any further testimony on or before March 1, 1912, upon giving ten days' notice of the time and place of taking such testimony to the counsel for the complainants. That the above set forth times designated for taking testimony may by varied upon consent of counsel for the respective parties which shall have the same effect as an order made by this Court when entered upon the record before the Commissioner; but the time for concluding the testimony shall not be extended without the further order of this Court.

April 24, 1911.

And afterwards, to wit, on the 29th day of May, A. D. 1911, the following orders for appearance were filed, viz:

267 *Order for Appearance.*

Supreme Court of the United States, October Term, 1910.

No. 5. Orig'l.

THE PEOPLE OF THE STATE OF NEW YORK, Comp'l't,
vs.
STATE OF NEW JERSEY et al.

The Clerk will enter my appearance as counsel for the Complainant.

(Name) WILLIAM J. O'SUILLIVAN,
Assistant Corporation Counsel.

(P. O. Address:) Hall of Records, New York City.

NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

Endorsed: Supreme Court U. S. October Term, 1910. Term No. 5 Origl. Appearance for Complt. Filed May 29, 1911.

268 *Order for Appearance.*

Supreme Court of the United States ,October Term, 1910.

No. 5. Orig'l.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY et al.

The Clerk will enter my appearance as counsel for the Complainant.

(Name) WILLIAM A. McQUAID,
Deputy Attorney General N. Y. State.

(P. O. Address:) 299 Broadway, New York.

NOTE.—Must be signed by a member of the Bar of the Supreme Court United States. Individual and not firm names must be signed.

Endorsed: Supreme Court U. S. October Term, 1910. Term No. 5 Origl. Appearance for Complt. Filed May 29, 1911.

And afterwards to wit on the 7th day of October, A. D. 1911, the following motion was filed, viz:

269 Supreme Court of the United States, October Term, 1911.

In Equity. No. 3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

(1) Notice of Motion on Behalf of the Complainants, The People of the State of New York, for an Order Extending the Time for the Taking of Testimony.

(2) Motion on Behalf of the Complainants, The People of the State of New York, for an Order Extending the Time for the Taking of Testimony.

THOMAS CARMODY,
Attorney General of the State of New York.

WILLIAM J. O'SULLIVAN,
Special Counsel for the Complainants.

270 In the Supreme Court of the United States, October Term, 1911.

In Equity. No. 4. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Notice.

To the State of New Jersey and the Passaic Valley Sewerage Commissioners, defendants:

You will please take notice that the complainants herein, The People of the State of New York, by their counsel, will move
271 the above court on Monday, October 16, 1911, for an order extending the time in which to take the testimony of the complainants.

THOMAS CARMODY,
Attorney General of the State of New York.

WILLIAM J. O'SULLIVAN,
Special Counsel, Hall of Records, New York City.

272 In the Supreme Court of the United States, October Term, 1911.

In Equity. No. 4, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Motion on Behalf of the Complainants, The People of the State of New York, for an Order Extending the Time in Which to Take the Testimony of Complainants.

To the Honorable the Chief Justice of the United States and the Associate Justice of the Supreme Court of the United States:

Come now the People of the State of New York, by William J. O'Sullivan, their counsel, and move the court as follows:

First. That this court by its order extend the time of the complainants herein for the presentation of their testimony so
273 that the complainants may take testimony at such place as they may indicate between the first day of December, 1911, and the first day of April, 1912, upon giving ten (10) days' notice

of the time and place of taking testimony to the counsel for the defendants.

Second. That the defendants may take testimony at such place as they may indicate between the first day of April, 1912, and the first day of October, 1912, excluding the months of July and August of the year 1912, upon giving ten (10) days' notice of the time and place of taking testimony to counsel for the complainants herein.

Third. That the complainants may take testimony in rebuttal between the first day of Ocober, 1912, and the first day of December, 1912, at such time and place as they may indicate upon giving ten (10) days' notice to the counsel for the defendants.

Fourth. That the defendants may then offer any further testimony in sur-rebuttal between the first day of December, 1912, and the first day of February, 1913, upon giving ten (10) days' notice of the time and place of taking such testimony to the counsel for the complainants.

Fifth. That the complainants shall then conclude the taking of any further testimony on or before the thirty-first day of
274 March, 1913, upon giving ten (10) days' notice of the time and place of taking such testimony to counsel for the complainants.

6. Sixth. That the above set forth times designated for taking testimony may be varied upon consent of counsel for the respective parties, which shall have the same effect as an order made by this court when entered upon the record before the commissioner; but the time for concluding the testimony shall not be extended without the further order of this court.

THOMAS CARMODY,
Attorney General of the State of New York

WILLIAM J. O'SULLIVAN,
Special Counsel for the Complainants,
Hall of Records, New York City.

275 As cause for this motion it is shown:

That an order of this court, issued April 24, 1911, set forth in the third paragraph thereof: "It is further ordered that the complainants may take testimony at such place as they may indicate between the first day of June, 1911, and the first day of October, 1911, upon giving ten (10) days' notice of the time and place of taking testimony to the counsel for the defendants."

That on June 8, 1911, the commissioner appointed to take the testimony in this cause, Mr. James D. Maher, of the District of Columbia, called a meeting of the respective counsel for both complainants and defendants herein at 299 Broadway, in the City of New York, State of New York. That the respective counsel for both parties appeared in response to the commissioner's notice at the time and place set forth therein for the purpose of arranging a date to commence the hearing of testimony. That special counsel for the State of New York suggested June 12, 1911, as a convenient time for the hearing, provided counsel for the State of New Jersey

would waive the necessary ten days' notice under the order. That counsel for defendants urged that they had important legal engagements in the courts of the State of New Jersey during the weeks commencing June 12, 1911, and June 19, 1911, and that for accommodation of defendants' counsel the day set for the first hearing was the twenty-sixth day of June, 1911, at 10:30 a. m., at 290 Broadway, New York City.

276 That the complainants herein duly presented testimony which now forms a part of the record of this case on the following days: June 26, 27, 28, and 29, 1911. That this testimony consisted in the lay testimony of officers of the great civic bodies of the city of New York interested in the preservation of the utilities of New York's great asset, namely, her harbor waters.

That on the 29th day of June, 1911, upon the conclusion of the day's hearing of testimony before the commissioner appointed herein, Mr. James D. Maher, complainants' counsel stated:

"I have notified a number of representatives of these civic bodies and public spirited citizens that I do not desire to present any further testimony of this prefatory character as to the conditions that were observable by laymen and people having the interests of the harbor at heart either from commercial or sanitary standards, and as the rest of the testimony will be exceedingly scientific and technical, and as I find that some of my leading experts are in European countries and in remote parts of this country, I will ask for an adjournment until some early day in September when I can marshal my scientific matter and conserve time by presenting it in proper shape."

This statement appears on page 211 of volume I, of the typewritten record in the suit herein.

That the State of New York declined to furnish an appropriation for the prosecution of this suit, on the grounds that the city of New York would be the chief beneficiary from the suc-

277 cessful prosecution of the suit herein, and that in consequence thereof it was proper for that municipality to appropriate a sufficient sum of money for the payment of the expenses of this suit. That thereupon the city of New York appropriated moneys for the purpose of defraying the expenses of this litigation. That on the 20th day of July, 1911, the special counsel designated to prosecute this suit in the interest of the State of New York was duly notified that the sum of fifty thousand dollars was available for the expenses incident to the presentation of the scientific data upon which New York State's contention in this suit rests. That for several years past commissions specially appointed have been accumulating scientific facts and other data relative to the capacity of New York's harbor waters to digest sewage and to ascertain whether or not these waters could assimilate the vast quantity of sewage from inland communities in the State of New Jersey, amounting at full capacity to approximately 360,000,000 gallons per day, and do so without intolerable nuisance and grave menace to the health and property of the citizens of New York City. That this accumulated data embraces several thousand chemical analyses and

bacteriological investigations and also a long series of flotation tests, current experiments, harbor bottom contour, tidal phenomena, geodetic surveys, and a large number of scientific observations both complex and technical. That from the 20th day of July, 1911,
278 when the appropriation passed by the Board of Estimate and Apportionment of the city of New York was available for the prosecution of this suit in behalf of the complainants, the special counsel for complainants had been continuously and diligently engaged in the preparation of the vast amount of technical data for its suitable presentation in the suit herein. That in securing the services of eminent specialists and experts in chemistry, bacteriology, sanitary engineering, and other departments of science, the counsel for the complainants was confronted with the fact that his most eminent scientists were at great distances from the city of New York during the summer months of July and August, and experienced great difficulties in reaching many of them in remote parts of this and other countries. That when finally gathered together, a large amount of scientific data, both complex and technical, had to be submitted for their consideration, and that great diligence and continued industry had to be put forth in the preparation of this scientific testimony for the purposes of complainants' contention, involving an average of eighteen hours per day by complainants' counsel in order to be equipped for the forthcoming hearings in this suit, set for the fifth day of September, 1911.

That on September 5, 1911, at 10.30 a. m., the commissioner appointed to take testimony in this suit opened these hearings at 299 Broadway, in the City of New York. That these complain-
279 ants presented testimony until the ordinary hour for recess on that day, namely, at 1 p. m., when a recess for luncheon was taken until 2 p. m.

That during the recess counsel for the defendants made proposals with a view to an adjustment of the suit, and as a result of this conference the details were to be referred to a committee of six experts, three representing the complainants and three representing the defendants; and that an adjournment pending these negotiations was requested to September 11 by counsel for the defendants.

That on September 8 and September 9, 1911, the joint committees of experts held conferences but failed to agree on establishing a standard effluent acceptable to both complainants and defendants.

That on September 11, 1911, at 10.30 a. m., the commissioner appointed by this court to take the testimony herein attended in accordance with the adjournment on September 5. That counsel for both complainants and defendants concluded that further conferences should be held between the respective counsel of the parties to this suit, and counsel for defendants requested that a further adjournment be taken to the 18th day of September, 1911, at 10.30 a. m.

That on September 13 and September 16 conferences were had between the respective counsel for both parties at both 299 Broadway, New York City, and at 763 Broad street, Newark, in the
280 State of New Jersey, and that these negotiations are still pending.

That on September 18, September 19 and September 20 Mr. James D. Maher, the commissioner appointed to hear testimony herein, held hearings at the City Hall, in the city of New York, and that these complainants presented the oral testimony of the witnesses who had made investigations of a scientific character as commissioners of the New York Bay Pollution Commission, appointed by the Governor of the State of New York, and the life of whose commission lasted from the year 1903 to the year 1905, both inclusive.

That on September 21, 1911, at 9.30 a. m., counsel for complainants received in the morning's mail letters from physicians certifying the inability of two material witnesses to attend the hearing and testify. That thereupon complainants' counsel telephoned to a third witness whose testimony would be supplemental and corroborative of one of the sick witnesses, requesting his attendance, and that this last witness, whose work was done between 1903 and 1905, under the direction of one of the commissioners, who was prostrated by illness, was to have been offered out of its regular sequence, but complainants' counsel received a letter from the witness so notified at the opening of the hearings that he would be unable to attend before 1 p. m., as he was in charge of the Mount Prospect Laboratories and was on a tour of the watershed that supplies New York City with its domestic water supply, and that as it was currently be-
281 lieved that New York City was threatened with a water famine, his duties imperatively demanded this tour of inspection. That thereupon, on the presentation of these letters to defendants' counsel, and upon the assurance of Mr. James D. Maher, the commissioner appointed to take testimony herein, that his duties in the Supreme Court of the United States would not permit of his giving more than one more day at the present sittings during the month of September, an adjournment would be taken subject to call upon notice by the commissioner, Mr. Maher.

That the conclusion of the hearings as above described has fully consumed the allotted time of the complainants herein for the presentation of their case, and through no fault of the complainants they are now unable without a further extension of time to present their case.

That the extension of time prayed for is necessary to the complainants herein for the proper presentation of the vast amount of technical data accumulated during eight years' work by three State commissions appointed to make scientific investigations of New York's harbor waters and as to their capacity to assimilate the enormous quantity of New Jersey's sewage from 103 square miles of her inland communities, which threatens a nuisance of portentous dimensions, threatening alike the health of the citizens of New York and the commercial pre-eminence of New York City itself.

That in addition to the immense array of scientific facts
282 gathered by these commissions during their eight years of labor, that these complainants intend to offer the scientific testimony of the most eminent men in sanitary science, chemistry, bacteriology, and other specialties for the interpretation of the scientific facts so gathered by these commissions.

That to accord with the duties of the commissioner appointed herein to make testimony, that at least four months will be necessary for the presentation in legal form of this immense amount of technical data offered to sustain the allegations in the complainants' bill of complaint and to prove the complainants' contention that the threatened nuisance apprehended from New Jersey's trunk sewer designed to convey the house refuse and trade wastes from over twenty of New Jersey's municipalities and inland communities is well founded, and that the waters of New York Bay are unable to assimilate and digest such an enormous amount of fifth as is implied in the 360,000,000 gallons of sewage to be discharged daily a short distance from the southern end of Manhattan Island.

THOMAS CARMODY,
Attorney General of the State of New York.

WILLIAM J. O'SULLIVAN,
Special Counsel for the Complainants,
Hall of Records, New York City.

283 Supreme Court of the United States, October Term, 1911. No. 4, Original. The People of the State of New York, Complainants, vs. State of New Jersey et al. Motion of Complainants to Extend Time for Taking Testimony. Filed Oct. 7, 1911.

284 & 285 And afterwards, towit, on the 18th day of October, A. D. 1911, the following entry appears of record, viz:

4, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY et al.

The motion for an order extending the time for taking testimony herein was submitted to the consideration of the Court by Mr. William J. O'Sullivan, of counsel for the complainants, in support of the motion, and by Mr. Edmund Wilson, Mr. Robert H. McCarter, and Mr. Joseph Coult of counsel for the defendants in opposition thereto.

October 18, 1911.

286 And afterwards, to wit, on the 30th day of October, A. D. 1911, the following entry appears of record, viz:

4. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY et al.

On consideration of the motion to extend the time for taking testimony in this cause, It is now here ordered by the Court that the

time for complainants to take further testimony be, and the same is hereby, extended to March 31, 1912, that the defendants may take testimony between April 1st, 1912 and September 15, 1912, and the complainants may take testimony in rebuttal between September 15th, 1912, and December 1st, 1912.

October 30, 1911.

287 And afterwards, to wit, on the 8th day of April, A. D. 1912, the following entry appears of record, viz:

4. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainant,

vs.

THE STATE OF NEW JERSEY et al.

Mr. William J. O'Sullivan, of counsel for the complainant, submitted to the consideration of the Court a motion to extend the time for taking testimony in this cause.

April 8, 1912.

And on the same day the motion to extend time was filed in the words & figures following, viz:

288 Supreme Court of the United States, October Term, 1911.

In Equity. No. 4. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,

vs.

STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

(1) Notice of Motion on Behalf of the Complainants The People of the State of New York for an Order Extending the Time for the Taking of Testimony.

(2) Motion on Behalf of the Complainants The People of the State of New York for an Order Extending the Time for the Taking of Testimony.

THOMAS CARMODY,
Attorney General of the State of New York.

WILLIAM J. O'SULLIVAN,
Special Counsel for the Complainants.

289 In the Supreme Court of the United States, October Term, 1911.

In Equity. No. 4. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Notice.

To the State of New Jersey and the Passaic Valley Sewerage Commissioners, Defendants:

You will please take notice that the complainants herein, The People of the State of New York, by their counsel, will move
290 the above court on Monday, April 8, 1912, for an order extending the time in which to take the testimony of the complainants.

THOMAS CARMODY,
Attorney General of the State of New York.

WILLIAM J. O'SULLIVAN,
Special Counsel, Hall of Records, New York City.

291 In the Supreme Court of the United States, October Term, 1911.

In Equity. No. 4. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Motion on Behalf of the Complainants, The People of the State of New York, for an Order Extending the Time in Which to Take the Testimony of Complainants.

To the Honorable the Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

Come now The People of the State of New York, by William J. O'Sullivan, their counsel, and move the court as follows:
292 First. That this court by its order extend the time of the complainants herein for the presentation of their testimony so that the complainants may take testimony at such place as they may indicate between the first day of May, 1912, and the first day of October, 1912 (excluding the months of July and August of the

year 1912), upon giving ten (10) days' notice of the time and place of taking testimony to the counsel for the defendants.

Second. That the defendants may take testimony at such place as they may indicate between the second day of October, 1912, and the first day of February, 1913, upon giving ten (10) days' notice of the time and place of taking testimony to counsel for the complainants herein.

Third. That the complainants shall then conclude the taking of further testimony on or before the thirtieth day of April, 1913, upon giving ten (10) days' notice of the time and place of taking such testimony to counsel for the defendants.

Fourth. That the above-set-forth times designated for taking testimony may be varied upon consent of counsel for the respective parties, which shall have the same effect as an order made by this court when entered upon the record before the commissioner; but the time for concluding the testimony shall not be extended
293 without the further order of this court.

THOMAS CARMODY,
Attorney General of the State of New York.

WILLIAM J. O'SULLIVAN,
Special Counsel for the Complainants,
Hall of Records, New York City.

As cause for this motion it is shown:

That the order of this court issued October 30, 1911, set forth:

"On consideration of the motion to extend the time for taking testimony in this cause,

"It is now here ordered by the court that the time for complainants to take further testimony be, and the same is hereby, extended to March 31, 1912, that the defendants may take testimony between April 1, 1912, and September 15, 1912, and that the complainants may take testimony in rebutal between September 15, 1912, and December 1, 1912."

That under this order the commissioner appointed to take the testimony in this cause, Mr. James D. Maher, of the District of Columbia, set the 22d day of November, 1911, as the day at
294 which the hearings were to be resumed at the City Hall in the city of New York, N. Y.; that the taking of testimony proceeded on the following days: November 22, 23, 24, 27, 28, and 29; that the commissioner herein adjourned the further taking of testimony to December 27, 1911; that the hearings were resumed on that date, and testimony was taken on behalf of the complainants on December 27, 28, and 29, 1911, and were resumed and further testimony taken on January 3, 4, and 5, 1912; that on the 5th day of January, 1912, the commissioner herein adjourned the further taking of testimony to the 31st day of January, 1912; that on January 31, 1912, the illness of the commissioner herein occasioned an adjournment to February 1, 1912, and that, the illness assuming serious features, necessitated an indefinite adjournment and was subject to notice from the commissioner when his physical condition would permit the resumption of the taking of testimony.

That on February 10, 1912, counsel for complainants herein received a letter from Mr. James D. Maher, the commissioner appointed to take the testimony in this suit, which was dated February 9, 1912, in which, after setting forth the nature of the illness, it was stated:

"I will have to postpone any further taking of testimony until about the 19th of March."

295 That on February 19, 1912, counsel for these complainants earnestly requested Mr. James D. Maher, the commissioner herein, to grant "one day for a hearing between your receipt of this and February 29," and setting forth the urgency for this request. That in response thereto the commissioner herein graciously set the 27th day of February, 1912, for the requested hearing, and upon that day the testimony of Mr. H. de B. Parsons, who was about to leave for a prolonged stay in southern Europe, was placed on record, to the great convenience of these complainants.

That on February 22, 1912, counsel for these complainants received a letter from Mr. Adrian Riker, counsel for the Passaic Valley Sewerage Commission, dated February 21, 1912. Mr. Riker set forth in said letter that Mr. McCarter, who is the special counsel for the State of New Jersey, and himself, for the Passaic Valley Sewerage Commissioners, these being the defendants in this suit, had arranged to leave for Florida during the latter half of the month of March, 1912, "and therefore the tentative arrangement for the continuation of the taking of testimony in the above case on March 19th, suggested by Mr. Maher, would interfere with it; that counsel for complainants in answering this letter recalled to counsel for defendants that these complainants were obliged to complete

296 the taking of their testimony by March 31, 1912, under the order of the Supreme Court of the United States, dated October 30, 1911; that in response to this communication counsel for defendants, in a letter dated February 24, 1912, stated:

"So far as the expiration of your time is concerned I have rather assumed that, owing to the illness of the commissioner, you would wish to make an application for further extension, and that this application for a reasonable extension under the circumstances should not be opposed."

That for several years past commissions specially appointed have been accumulating scientific facts and other data relative to the capacity of New York's harbor waters to digest sewage, and to ascertain whether or not these waters could assimilate the vast quantity of sewage from inland communities in the State of New Jersey, largely increased since the last order was granted, amounting at full capacity to approximately 410,000,000 gallons per day, and do so without intolerable nuisance and grave menace to the health and property of the citizens of New York city; that this accumulated data embraces several thousand chemical analyses and bacteriological investigations and also a long series of flotation tests, current ex-

297 periments, harbor-bottom contour, tidal phenomena, geodetic surveys, and a large number of scientific observations both complex and technical.

That to interpret this vast amount of technical data the services

of eminent specialists and experts in chemistry, bacteriology, sanitary engineering, and other departments of science were retained by these complainants.

That the extension of time prayed for is necessary to the complainants herein for the proper presentation of the vast amount of technical data accumulated during eight years' work by three State commissions appointed to make scientific investigations of New York's harbor waters and as to their capacity to assimilate the enormous quantity of New Jersey's sewage from approximately 120 square miles of her inland communities, which threatens a nuisance of portentous dimensions, threatening alike the health of the citizens of New York and the commercial pre-eminence of New York city itself.

That, in addition to the immense array of scientific facts gathered by these commissions during their eight years of labor, these complainants intend to offer the scientific testimony of the most eminent men in sanitary science, chemistry, bacteriology, and other
298 specialties for the interpretation of the scientific facts so gathered by these commissions.

That the extension of time prayed for is necessary for the presentation in legal form of this immense amount of technical data offered to sustain the allegations in the complainants' bill of complaint and to prove the complainants' contention that the threatened nuisance apprehended from New Jersey's trunk sewer, designed to convey the house refuse and trade wastes from over twenty-seven of New Jersey's municipalities, townships, and inland communities, is well founded, and that the waters of New York bay are unable to assimilate and digest such an enormous amount of filth as is implied in the 410,000,000 gallons of sewage to be discharged daily a short distance from the southern end of Manhattan Island.

That since this court granted the order of October 30, 1911, a bill has been introduced in the New Jersey legislature increasing the inland territory to be served by this enormous trunk sewer of over twenty-six miles in length, and that the territory now contemplated to be added to the Passaic Valley Sewerage District will include many municipalities and townships in addition to those favoring this project, under which the volume of filth to be discharged into New York's upper bay will render New York city intolerable
299 for either business or residence, and would destroy property values not readily within the range of calculation.

THOMAS CARMODY,
Attorney General of the State of New York.

WILLIAM J. O'SULLIVAN,
Special Counsel for the Complainants,
Hall of Records, New York City.

300 (Endorsed:) Supreme Court of the United States. October Term, 1911. No. 4, Original. In Equity. The People of the State of New York, Complainants, vs. State of New Jersey and Passaic Valley Sewerage Commissioners, Defendants. (1) Notice of Motion on Behalf of the Complainants The People of the State of

New York for an Order Extending the Time for the Taking of Testimony. (2) Motion on Behalf of the Complainants The People of the State of New York for an Order Extending the Time for the Taking of Testimony. Filed Apr. 8, 1912.

301 And afterwards to wit, on the 15th day of April A. D. 1912, the following entry appears of record, viz:

4. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS.

On consideration of the motion to extend the time for taking testimony in this cause, It is now here ordered by the Court that the time for the complainants to take further testimony be extended to the first day of October, 1912, that the defendants may take testimoney between the second day of October, 1912, and the first day of February, 1913, and that the complainants shall then conclude the taking of further testimony on or before April 30th, 1913.
April 15, 1912.

302 And afterwards, to wit, on the 2d day of January A. D. 1913, the following stipulation was filed, viz:

In the Supreme Court of the United States, October Term, 1912.

In Equity. No. 3. Original on the Docket for Said October Term.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Stipulation.

It is hereby stipulated by the solicitors for the parties to the above cause that the time for the taking of evidence on behalf of the defendants shall be extended to March 1, 1913, and that the time for the taking of the testimony of the complainants in rebuttal be extended to June 1, 1913, and that an order may be entered in accordance herewith by consent.
Dater December 31, 1912.

W. J. O'SULLIVAN,
Counsel for Complainants.
ADRIAN RIKER,
Solicitor for and of Counsel With Defendant Passaic Valley Sewerage Commissioners.
ROBERT H. McCARTER,
Of Counsel with the State of New Jersey.

Endorsed: In the Supreme Court of the United States. October Term, 1909. The People of the State of New York, Complainants v. The State of New Jersey and Passaic Valley Sewerage Com-
303 missioners Defendants. In Equity No. 6 Original on the docket for said October Term. Stipulation. Law Offices Riker and Riker Newark N. J.

Endorsed: Supreme Court U. S. October Term, 1912. Term No. 3, Original. The People of the State of New York, Complainants, vs. The State of New Jersey and Passaic Valley Sewerage Commissioners. Stipulation of counsel *en*tending time for taking testimony. Filed January 2, 1913.

304 And afterwards, to wit, on the 6th day of January A. D. 1913, the following entry appears of record, viz:

3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS.

On motion of Mr. Frederick S. Tyler in behalf of counsel and in pursuance of a stipulation of counsel for the respective parties, It is now here ordered by the Court that the time for taking testimony in this cause on behalf of the defendants be, and the same is hereby, extended to March 1, 1913, and that the time for the taking of the testimony for the complainants in rebuttal be, and the same is hereby extended to June 1, 1913.

January 6, 1913.

And afterwards towit, on the 16th day of April A. D. 1913, the following stipulation was filed, viz:

305 W. J. O'S.
R. H.

Fol. 1.

Supreme Court of the United States, October Term, 1912.

No. 3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Stipulation.

It is hereby stipulated by the solicitors for the parties to the above cause that the time for the taking of evidence on behalf of the

complainants shall be extended to July 1, 1913, and that an order may be entered in accordance herewith by consent.

Dated, April —, 1913.

ADRIAN RIKER,
Solicitor for and Counsel With Defendant, The Passaic Valley Sewerage Commissioners.
ADRIAN RIKER,
For Robert H. McCarter, of Counsel With the State of New Jersey.
WILLIAM J. O'SULLIVAN,
Of Counsel With The People of the State of New York, Complainants.

306 Endorsed: Supreme Court of the United States, No. 3. Original, October Term, 1912. The People of the State of New York, Complainants, vs. The State if New Jersey and Passaic Valley Sewerage Commissioners. (Orig.) Stipulation Archibald R. Watson, Corporation Counsel, Hall of Records, Borough of Manhattan, New York City. Due and timely service of a — of which the within is a copy, is hereby admitted. New York 191 Attorney for the — To —— ——, Esq.,

Endorsed: Supreme Court U. S. October Term, 1912. Term No. 3, Original. The People of the State of New York, Complainants vs. The State of New Jersey et al. Stipulation extending time to take testimony. Filed April 16, 1913.

307 And afterwards, to-wit, on the 21st day of April, A. D. 1913, the following entry appears of record, viz:

3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS.

On motion of Mr. Frederick S. Tyler in behalf of counsel and in pursuance of a stipulation of counsel for the respective parties herein. It is now here ordered by the Court that the time for taking testimony herein on behalf of the complainants be, and the same is hereby extended to July 1, 1913.

April 21, 1913.

308 And afterwards, to-wit: on the 3d day of November, A. D. 1913, the Report of the Commissioner was filed in words and figures following, viz:

Supreme Court of the United States, October Term, 1913.

THE PEOPLE OF THE STATE OF NEW YORK, Complainant.
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS.

To the Honorable the Supreme Court of the United States:

The undersigned Commissioner, appointed by an order entered in this cause on the 24th day of April, 1911, to take and return such evidence as the parties to said cause should produce, respectfully reports to the Court, that, pursuant to the said order, he opened the Commission conferred on him in the City of New York, State of New York, on the 26th day of June, 1911, and, the counsel for the respective parties being present, proceeded to execute the said Commission on that day and various other days in said City of New York and the City of Newark, State of New Jersey, until the 27th day of June, 1913, on which last named day, the parties not offering any more testimony, the Commission was closed.

The said Commission was executed by receiving the testimony of the several witnesses named in the testimony, who were sworn to testify to the truth, the whole truth, and nothing but the truth, before giving their evidence, and the testimony so given by them was taken down by stenographers in the presence of the Commissioner, and is herewith submitted, together with the Exhibits offered in evidence. Said testimony is contained in 4729 typewritten pages, and the Exhibits offered on behalf of the com-
309 plainant are numbered from 1 to 217, inclusive, and those offered on behalf of the defendants and numbered from 1 to 7, inclusive. The said testimony and Exhibits have been deposited with the Clerk of this Honorable Court.

Respectfully submitted,

JAMES D. MAHER, *Commissioner.*

October 13, 1913.

[Endorsed:] Supreme Court U. S., October Term, 1913. Term No. 3. Original. The People of the State of New York, Complainant, vs. The State of New Jersey et al. Report of Commissioner. Filed Nov. 3d, 1913.

310 And afterwards, to-wit: on the 11th day of November, A. D. 1913, the following stipulation was filed, viz:

W. J. O's.
A. D.
Fol. 1.

Supreme Court of the United States, October Term, 1913.

No. 3, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Stipulation.

It is hereby stipulated by the solicitors for the parties to the above cause that complainant's exhibits numbered respectively 12, 13, 19, 143, 157 and 217 shall not be reproduced by the printer of the record herein, but shall be kept in the custody of the Clerk of the Supreme Court of the United States during argument of the above suit, and that this stipulation in accordance herewith be entered by consent.

Dated, October 31st, 1913.

RIKER AND RIKER,
Solicitor- for and of Counsel with Defendant, The Passaic Valley Sewerage Commissioners.
ROBERT H. McCARTER,
Of Counsel with the State of New Jersey.
WILLIAM J. O'SULLIVAN,
Of Counsel with The People of the State of New York, Complainants.

311 [Endorsed:] Supreme Court of the United States. No. 3, Original October Term, 1912. The People of the State of New York, Complainants, vs. The State of New Jersey and Passaic Valley Sewerage Commissioners, Defendants. (Original) stipulation. Hall of Records New York City, Borough of Manhattan.

[Endorsed:] Supreme Court U. S., October Term, 1913. Term No. 3, Original. The People of the State of New York, Complainants, vs. The State of New Jersey et al. Stipulation of counsel that certain of the complainant's exhibits be omitted in printing. Filed November 11, 1913.

312 And afterwards, towit, on the 18th day of December, A. D. 1913, the following stipulation was filed, viz:

Supreme Court of the United States, October Term, 1913.

No. 3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

It is hereby stipulated and agreed by and between the counsel for the respective parties to this cause that an order may be entered by this Court fixing the compensation of James D. Maher, the Commissioner heretofore appointed to take and return the testimony in this cause, at the sum of Five thousand dollars ($5,000.00), one-half of said amount to be paid by the complainants and one-half by the defendants, said amount to be taxed as costs in this cause.

WILLIAM J. O'SULLIVAN,
Of Counsel for Complainants.
ROBERT H. McCARTER,
Counsel for the Defendant State of New Jersey.
ADRIAN RIKER,
Counsel for the Defendants Passaic Valley Sewerage Commissioners.

313 Supreme Court of the United States. October Term, 1913. Term No. 3, Original. The People of the State of New York, Complainants, vs. State of New Jersey and Passaic Valley Sewerage Commissioners. Stipulation as to amount of compensation to be paid Commissioner. Filed Dec. 18th, 1913. Office of the Clerk, Supreme Court U. S. Received Dec. 18, 1913.

314 And afterwards, towit, on the 22d day of December, A. D. 1913, the following entry appears of record, viz:

3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainant,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS.

It being brought to the attention of the Court that counsel for the respective parties herein have agreed upon the amount hereinafter named as reasonable compensation to be paid to the Commissioner appointed to take and return the testimony in this cause in addition to the advances heretofore made for his expenses, It is now here ordered by the Court that the sum of five thousand dollars be, and it is hereby, allowed to James D. Maher, Esquire, as compensation for services rendered by him as Commissioner herein, one half

of said amount to be paid by the complainant and one half by the defendants, said sum to be taxed as part of the costs.

December 22, 1913.

315 And afterwards, towit, on the 16th day of November, A. D. 1914, the following entry appears of record, viz:

3. Original.

THE STATE OF NEW YORK, Complainant,
vs.
THE STATE OF NEW JERSEY et al.

The motion to dismiss in this cause was submitted to the consideration of the Court on printed arguments by Mr. R. H. McCarter in support of the same, and Mr. W. J. O'Sullivan in opposition thereto.

November 16, 1914.

Which said motion is in the words and figures following, viz:

316 Supreme Court of the United States, October Term, 1914.

In Equity. No. 3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Notice of Motion on Behalf of Defendants, State of New Jersey and Passaic Valley Sewerage Commissioners, to Dismiss Complainants' Bill of Complaint.

John W. Westcott, Attorney General of New Jersey.
Robert H. McCarter, Special Counsel for New Jersey.
Adrian Riker, Counsel for Passaic Valley Sewerage Commissioners.

317 In the Supreme Court of the United States, October Term, 1914.

In Equity. No. 3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Notice.

To the People of the State of New York, Complainant:

You will please take notice that the defendants herein, the State of New Jersey and the Passaic Valley Sewerage Commissioners, by

their counsel, will move the above Court on Monday, November sixteenth, 1914, for a decree dismissing the bill of complaint in the above entitled cause.

JOHN W. WESCOTT,
Attorney General of New Jersey.
ROBERT H. McCARTER,
Special Counsel for New Jersey.
ADRIAN RIKER,
Counsel for Passaic Valley Sewerage Commissioners.

318 In the Supreme Court of the United States, October Term, 1914.

In Equity. No. 3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Motion on Behalf of the Defendants State of New Jersey and Passaic Valley Sewerage Commissioners to Dismiss Complainants' Bill of Complaint in the Above Cause.

To the Honorable the Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

Come now the State of New Jersey and the Passaic Valley Sewerage Commissioners by their counsel, and move the court as follows:

First. That this Court by its decree do dismiss complainants' bill of complaint with costs, because of the delay and neglect of the complainant in bringing the above entitled cause to hearing upon the pleadings and proofs in the same. As cause for this motion it is shown that the docket of this court shows that the bill of com-
319 plaint was filed on the seventeenth day of October, 1908; that the defendants' answer was filed on the fourth day of January, 1909; that a petition for intervention on behalf of the United States was filed on January 25th, 1909, and that this petition was withdrawn by the United States on March 6th, 1910; that complainants' replication was not filed until November 8th, 1909, and then only because of a notice of motion on behalf of defendants to dismiss the suit for want of prosecution. That complainant did not take an order for proofs until April 24th, 1911, and then took no action looking toward the taking of proofs until after the Commissioner appointed by the Court had himself made the appointment, at which counsel agreed upon a date for beginning testimony under the order made. That no adjournments were asked for or suggested on behalf of the defendants, counsel for defendants holding themselves ready to go on from day to day as the complainants' counsel might determine. By order of this Court made October 30, 1911, the time for the taking of complainants' further testimony was extended from the first day of October, 1911, to March 31, 1912; that by further order of this Court entered April 15, 1912, the time for taking complainants' testimony was further extended to the first day of October, 1912, that the testimony of the defendants was taken

between the first day of October, 1912, and the first day of March, 1913; that the time for the taking of complainants' rebuttal testimony was extended by order of this Court entered April 21, 1913, to July 1, 1913; that the time allowed and occupied by the complainants for taking their direct testimony covered the period from the first day of June, 1911, to the first day of October, 1912, and that the time allowed for the taking of their rebuttal testimony covered the period from March 1, 1913, to July 1, 1913;

320 that since the first day of July, 1913, complainant has taken no steps looking toward the bringing on of the action to hearing before this honorable Court, by actual printing and service of copies of the printed case, by noticing the same for hearing, or by having the same duly placed upon the calendar of this honorable Court.

That this action is brought to enjoin the construction and operation of a great public work, undertaken by the defendants for the relief of the great population located in the Passaic Valley District of the State of New Jersey, and that the issues involved in the suit should have been brought to hearing and determination by this honorable Court long before this time; that the pendency of the suit undetermined, while not in itself preventing the prosecution of the great work so undertaken by the defendants, nevertheless has an injurious effect upon the ongoing and completion thereof.

321 Defendants' Points in Support of the Motion.

This motion is urged upon the authority of the practice indicated in Daniells Chancery Pleadings and Practice, 5th edition, Vol. 1, page 766. It appears from the above citation that any defendant in the Court of Chancery of Englnad might, upon notice, move the Court that the bill of complaint be dismissed with costs for want of prosecution, and the Court may order acordingly in the following cases: (3) Where the plaintiff, having obtained no order to enlarge the time, does not set down the cause to be heard and obtain and serve a subpœna to hear judgment within four weeks after the evidence is closed.

No rule of this honorable Court appears regulating the practice in such case upon original bill filed in this honorable Court. Rule 3 of this honorable Court provides as follows:

"This Court considers the form of practice of the Courts of King's Bench and of Chancery of Engand as affording outlines for the practice of this Court, and will from time to time make such alterations therein as circumstances may render necessary."

We therefore respectfully submit that the motion should be granted.

Yours respectfully,

JOHN W. WESCOTT,
Attorney General of New Jersey.
ROBERT H. McCARTER,
Special Counsel for New Jersey.
ADRIAN RIKER,
Counsel for Passaic Valley Sewerage Commissioners.

October 15th, 1914.

322 Supreme Court of the United States, October Term, 1914.

In Equity. No. 3, Original. The People of the State of New York, Complainants, vs. State of New Jersey and Passaic Valley Sewerage Commissioners, Defendants. Notice of motion on behalf of defendants, State of New Jersey and Passaic Valley Sewerage Commissioners, to dismiss complainants' bill of complaint. Filed Nov. 16, 1914.

323 And on the same day the following paper was filed, viz:

Supreme Court of the United States, October Term, 1914.

In Equity. No. 3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

On Motion of the Defendants to Dismiss Complainants' Bill of Complaint.

Complainants' Argument in Opposition to the Motion.

James A. Parsons, Attorney General of the State of New York.
William J. O'Sullivan, Special Counsel for Complainants.

324 Supreme Court of the United States, October Term, 1914.

In Equity. No. 3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

On Motion of the Defendants to Dismiss Complainants' Bill of Complaint.

Complainants' Argument in Opposition to the Motion.

To the Honorable the Chief Justice of the United States and the Associate Justices of the Supreme Court of the United States:

Come now The People of the State of New York by William
325 J. O'Sullivan, their Counsel in opposition to the Defendants' motion, and respectfully submit to the Court:

First. That the complainants herein are wrongfully charged with "delay and neglect * * * in bringing the above entitled cause to hearing upon the pleadings and proofs in the same."

Second. That the extensive record in this suit comprising about one and one-half millions of words in typewriting, together with over

two hundred and twenty exhibits, many of which are voluminous, is now with the official printer of records for this court.

That a cheque for the sum of $18,175, has been deposited during the month of August, 1914, with the Clerk of this Court to defray the cost of printing this record and to cover the clerk's costs in accord with the duly furnished estimate thereof.

That this record is composed almost entirely of highly technical data furnished in the form of testimony and exhibits by the most eminent sanitarians, hydraulic; consulting; and sanitary engineers as well as by biologists; chemists; bacteriologists, bio-chemists and kindred specialists, on the questions peculiar to the issues involved in this cause.

The complainants in this cause have no available means for accelerating the printing of this large record. Even if such means were at complainants' disposal, they would be loathe to use them, fearing that the reproduction of such highly technical matter would suffer thereby in its accuracy, because, the many tabulations, charts, diagrams and maps require much care and patience in their accurate reproductions.

326 Third. That the defendants' statement appearing on page 3, line 8 of the motion papers, wherein the filing of complainants' replication is stated to have been occasioned by "a notice of motion on behalf of defendants to dismiss the suit for want of prosecution." This statement is grossly erroneous. No such notice of motion has ever been served upon these complainants at any stage of this suit up to this present notice of motion to dismiss for "delay and neglect."

Fourth. The statement appearing on page 3, line 18, of the defendants' motion papers "that no adjournments were asked for or suggested on behalf of the defendants" is also erroneous and misleading.

In Volume 2, at page 261, of the typewritten record of this cause now in the custody of the Clerk of this Court there is recorded a request made by Mr. Robert H. McCarter, Special Counsel for the State of New Jersey for an adjournment for one week, and again in Volume 2, at page 263, there is a second request made by Mr. Robert H. McCarter, for an adjournment of still another week. Both requests were acceded to by complainants.

In December of 1912, a stipulation was drafted by Mr. Adrian Riker, Counsel for the Passaic Valley Sewerage Commissioners and submitted to Special Counsel for the complainants with the request that he join therein for the purpose of extending the time for the hearings in this cause to the month of June, 1913. Special Counsel for the complainants herein in accord with the convenience of counsel for the Passaic Valley Sewerage Commissioners signed said stipulation which is now in the custody of the Clerk of this Court,

327 and upon which an order of this Court extending the time in accord therewith, was issued.

In April, 1913, a similar stipulation was entered into by Special Counsel for the complainants herein at the request of the counsel for the Passaic Valley Sewerage Commissioners which still

further extended the time for these hearings for the convenience of defendant's counsel to July 1st, 1913.

On page 4, line 2 of the motion papers appears the following statement:

"That since the first day of July, 1913, complainant has taken no steps looking toward the bringing on of the action to hearing before this honorable court, by actual printing and service of copies of the printed case, by noticing the same for hearing, or by having the same duly placed upon the calendar of this honorable court."

This statement is erroneous and misleading. These complainants have deposited with the Clerk of this Court, in the month of August, 1914, a cheque for the sum of money estimated to meet the expenses of printing the record in this case. This voluminous record has not yet left the printer's presses and so "service of copies" could not be made upon these defendants nor could the "noticing the same for hearing" be made until the printer has completed his work. For the same reason these complainants could not have this cause "duly placed upon the calendar of this honorable court."

Fifth. The defendants on page 4, line 15, of the motion papers state: "That the pendency of the suit undetermined, while not in itself preventing the prosecution of the great work * * *, nevertheless has an injurious effect upon the ongoing and com-
328 pletion thereof."

This statement seems conflicting in itself and with the facts relating thereto. The prosecution of this cause apparently has accelerated the work on this portentous scheme of vast pollution so menacing to the health and the great property interests of the citizens of New York. "The great work so undertaken by the defendants" is an enormous trunk sewer which is to transport the organic filth and trade refuse from thirty-seven municipalities and townships in the State of New Jersey, and discharge the putrescent menace at the rate of three hundred and sixty millions of gallons per day into Upper New York Bay, where its septic factors will continuously cast a pall of pestilent epidemics over a dense community of many millions of New York's citizens. The constructive operations on this "great work" has proceeded steadily until quite recently, when it was temporarily suspended. The cause of this temporary suspension as set forth in the public prints in the State of New Jersey, was "stringency in the money market" incident to the financial disturbance produced by the warfare in Europe.

Complainants' Points in Opposition to the Motion.

It is respectfully submitted:

That "the authority" upon which "this motion is urged" by the defendants, and which is cited from Daniell's Chancery Pleadings and Practice, 5th Edition, Volume 1, page 766," does not apply to an original bill filed by a sovereign state in this exalted Court.

329 That this Court in adopting "the form of practice of the Courts of King's Bench and of Chancery of England" does

so only "so far as the same may reasonably be applied." That it is unreasonable to seek by this motion to move this exalted Court to decree dismissal of "complainants' bill of complaint, with costs," because this complainant cannot perform the impossible at this stage of the cause, namely to "serve a subpœna to hear judgment within four weeks after the evidence is closed."

In the Sixth American Edition (1894, John M. Gould) of Daniell's Chancery Pleadings and Practice, Vol. 1, page 797 (*802) appears the following:

"A rule to speed the cause should precede a motion to dismiss."

Complainants respectfully submit that the motion should be denied, with costs.

JAMES A. PARSONS,
Attorney-General of the State of New York.
WILLIAM J. O'SULLIVAN,
Special Counsel for Complainants,
Municipal Bldg., New York City.

October 26, 1914.

330 (Endorsed:) Supreme Court of the United States, October Term, 1914. No. 3 Original. In Equity. The People of the State of New York, Complainants, vs. State of New Jersey and Passaic Valley Sewerage Commissioners, Defendants. On Motion of the Defendants to Dismiss Complainants' Bill of Complaint. Complainants' Argument in Opposition to the Motion. Filed Nov. 16, 1914.

331 And afterwards to wit on the 30th day of November, A. D. 1914, the following entry appears of record, viz:

3. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainant,
vs.
THE STATE OF NEW JERSEY et al.

On consideration of the motion to dismiss the bill of complaint herein, and of the argument of counsel thereupon had, as well in support of as against the same, It is now here ordered by the Court that the said motion be, and the same is hereby, denied.

November 30, 1914.

332 Supreme Court of the United States, October Term, 1910

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY AND PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

299 BROADWAY, NEW YORK CITY,
June 26th, 1911.

Before James D. Maher, Esq., Commissioner.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York;
William A. McQuaid, Esq., Deputy Attorney General, and
Dr. William J. O'Sullivan, Special Counsel, for The People of the State of New York, Complainants.
Edmund Wilson, Esq., Attorney General of the State of New Jersey;
Robert H. McCarter, Esq., of Counsel for the State of New Jersey;
Joseph Coult, Esq., and Adrian Riker, Esq., of Counsel for Passaic Valley Sewerage Commission, Defendants.

By direction of the Commissioner, James D. Maher, Esq., the following order is spread upon the record.

"Supreme Court of the United States, October Term, 1910.

No. 5, Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS.

On consideration of the motion of the complainants for the appointment of a Commissioner to take testimony in this cause and to fix the time for taking such testimony, and of the opposition
333 of counsel for the defendants thereto,

It is now here ordered by the Court that Mr. James D. Maher, of the District of Columbia, be, and he is hereby appointed a Commissioner to take and return the testimony in this cause, with the powers of a master in chancery, as provided in the Rules of this Court; but said Commissioner shall not make any findings of fact or state any conclusions of law.

It is further ordered that the complainants may take testimony at such place as they may indicate, between the first day of June, 1911, and the first day of October, 1911, upon giving ten days'

notice of the time and place of taking testimony to the counsel for the defendants.

That the defendants may take testimony at such place as they may indicate, between the first day of October, 1911, and the first day of January, 1912, upon giving ten days' notice of the time and place of taking such testimony to the counsel for the complainants herein.

That the complainants may take testimony in rebuttal between the first day of January, 1912, and the first day of February, 1912, at such time and place as they may indicate, upon giving ten days' notice to the counsel for the defendants.

The defendants shall then conclude the taking of any further testimony on or before March 1, 1912, upon giving ten days' notice of the time and place of taking such testimony to the counsel for the complainants.

That the above set forth times designated for taking testimony may be varied upon consent of counsel for the respective parties, which shall have the same effect as an order made by this Court when entered upon the record before the Commissioner; but the time for concluding the testimony shall not be extended without the further order of this Court.

April 24, 1911."

334 Pursuant to the foregoing Order and by agreement of counsel for the respective parties the taking of testimony in the above entitled cause was commenced in the City of New York on Monday, June 26th, 1911, at 10 A. M.

Mr. McQuaid: The Attorney General of the State of New York has requisitioned the Corporation Counsel of the City of New York to designate one of his Assistants to aid in the presentation of the State's case, and the prosecution in behalf of the State of New York, in conformity with the designation so made, has been placed in charge of Dr. William J. O'Sullivan, Assistant Corporation Counsel.

Mr. O'Sullivan: In the pleadings, may it please the Commissioner, it is admitted by the defendants that the State of New York and the State of New Jersey are states of the Union, and that the Passaic Valley Sewerage Commission is a body politic and corporate organized and existing under the laws of the State of New Jersey and a citizen of that state. The defendants admit in their answer that a part of the complaint known as Schedule A, being chapter 8 of the laws of 1834, is a true copy as set forth in the complainants' Bill of Complaint. The complainants wish to direct particular attention to Article III of chapter 8, laws of 1834, passed February 5th, 1834, as appears on page 14. The third paragraph on that page of the complainants' Bill of Complaint, Article III reads:

"The State of New York shall have and enjoy exclusive jurisdiction of and over all the waters of the Bay of New York and of and over all the waters of Hudson River lying west of Manhattan Island and to the south of the mouth of Spuyten Duyvil Creek, and of and over the lands covered by the said waters to the low water mark on

the westerly or New Jersey side thereof; subject to the following rights of property and the jurisdiction of the State of New Jersey, that is to say——"

then they are enumerated.

The defendants' answer concedes that that jurisdiction particularly deals with the police jurisdiction and relates to matters of
335 sanitation, quarantine and allied questions under which this very issue is raised. A large number of great civic bodies of this city have been thoroughly aroused to the portentous conditions menaced by the activities of the Passaic Valley Sewerage Commission. We will produce representatives of some of those great civic bodies who will describe the menace, not only to the health and comfort of the citizens of this great municipality, but to the commercial preeminence of this city and the state. I will ask Mr. Smith, the Vice Chairman of the Chamber of Commerce, to take the stand.

ROBERT A. C. SMITH, called as a witness on behalf of complainants, being first duly sworn by the Commissioner, testifies as follows:

Direct examination by complainants' counsel:

Q. What is your full name?
A. Robert A. C. Smith.
Q. Are you a resident of this city?
A. New York City.
Q. Are you connected with any of the large civic bodies of this city?
A. I am a member of the Chamber of Commerce and Acting Chairman of the Committee on Harbor and Shipping of the Chamber of Commerce of the City of New York.
Q. Are you by appointment connected with any New York and New Jersey bodies that have an interest in the harbor?
A. Yes, sir, Governor Dix appointed a Commission consisting of three members about two months ago to take up the question of harbor lines, the full details of which I do not suppose you want on the record here. That is a matter of record as to the duties of the Commission.
Q. I do want it.
A. Well, it is to act jointly with a Commission appointed by the Governor of New Jersey to take up the question of pier head lines and bulkheads and make a report with a view of taking care of our foreign commerce. As you are aware the ships that are now
336 being built are of extraordinary size and the harbor of New York is not able to care for these enormous ships, and this same Commission was able to recommend to the War Department, who have charge of the harbor lines in New York, the importance of granting to the present White Star Line temporary at least if they could not do so permanently the extension of the piers at the Chelsea section to enable the first ship of that line, the Olympic, now in port, to berth at that pier. Had the War Department failed to give that permission that ship would have been lying out in the middle of the

stream, that is her stern would have been out in the stream over 80 feet or more, which is certainly a source of danger to navigation, to say nothing of the danger to the ship itself as the vital parts of the ship would be exposed. I may say the same thing for the New Jersey side of it, because some of the lines now berthing in Jersey are going to have large ships and they are up against the same question. Those are the duties of our Commission. I emphasize this particularly so as to show you the importance of the Commission and the work that we have had placed upon us, because what we have to look forward to is as far in the future as we may consistently, to care for everything that we possibly can in the foreign commerce as well as the island trade of this country.

Q. Then one of the objects to be secured by the aggregation known as the Chamber of Commerce is to secure this commercial prominence of our port.

A. Yes sir.

Q. Has the Chamber of Commerce at any time taken interest in the harbor pollution.

A. It has.

Defendants' Counsel: May I ask for what purpose the Chamber of Commerce particularly should be interested?

Complainants' Counsel: Yes, I will reach that. I have just asked him, Judge, if one of the objects of the Chamber of Commerce was to secure the commercial prominence of this port, and he an-
337 swered yes, and anything, as I understand it, that will impair the usefulness of the port, or impair its healthfulness would strike at its commercial prominence.

Defendants' Counsel: I did not observe the relevancy of it and I do not now as you suggest it.

Q. To what extent has the Chamber of Commerce interested itself in the pollution of the harbor waters of New York Bay?

Defendants' Counsel: I think we ought to get an objection on the record, doctor?

The Commissioner: Note the objection.

Defendants' Counsel: The objection is that the answer called for by the question cannot possibly be relevant.

A. Through its committees and at the Chamber meetings itself before the full body of members it has taken action in the matter, and with your permission I will read the last — the meeting of the Chamber of Commerce, "Mr. A. Foster Higgins, Chairman of the Committee on Harbor and Shipping made a verbal report on the subject of the proposed Passaic Valley Sewer which it is planned to empty in New York Bay near Robbins Reef. This he condemns strongly and requested the authorization of the Chamber for him to represent it at the meeting of the Harbor Line Board to be held at the Army Building on December 9th, 1908, and vigorously oppose the granting of permission by the Board for the construction of such sewer. Mr. Higgins' report was unanimously approved and

he was duly authorized to appear at the hearing." That was a meeting of December 3rd, 1908.

Q. Has the Chamber of Commerce since then taken any active interest in the proposed nuisance about to be perpetrated by the Passaic Valley Sewerage Commission?

Defendants' Counsel: I move to strike out the question on the ground that it assumes that as matter of fact a nuisance has
338 been created or will be created.

Complainants' Counsel: I direct the gentleman's attention to his own answer in which it is set forth at some length that a gross and intolerable nuisance now exists all along the entire Passaic River, and that they are about to transfer that very nuisance into New York Bay.

Defendants' Counsel: We would refer in answer to that statement to the answer itself and to its legal import. We do not admit, in other words, that is the proper interpretation of the answer.

Q. (Repeated.) "Has the Chamber of Commerce since then taken any active interest in the proposed nuisance about to be perpetrated by the Passaic Valley Sewerage Commission?

A. I cannot answer that question directly because it is a matter of record. I have been quite active on the other questions, but I am certain that the Chamber of Commerce has had this matter constantly before its various Committees and representatives of all the different interests of the commerce of New York as I know it has come before me on other committees where I have been working, but not necessarily—not being a member of the Harbor and Shipping Committee at that time—I cannot give you that direct answer but any records or any action taken by the Chamber I should be very glad to have filed with you here if you desire it.

Q. What other action, if you know of any Mr. Smith, has been taken by the Chamber of Commerce in relation to this harbor pollution and this proposed nuisance?

A. I would like, if you would, to call upon the secretary to answer those questions as he is more familiar with the action that has been taken by the Chamber. I am only acting chairman on the Committee on Harbor and Shipping and he could more directly answer you those questions.

339 Q. Are you prepared at this time, Mr. Smith, to state what percentage of the foreign commerce of the United States is transacted in this City of New York?

Defendants' Counsel: I object to that as irrelevant, and also on the ground that this witness has not qualified.

A. I will be pleased to file with you the report of the Chamber of Commerce which covers the statistics rather than trust to the memory, but it is over forty per cent.

Q. How long have you been connected with the Chamber of Commerce, Mr. Smith?

A. Oh, a number of years, many years. I have been a member of

the Committee on Foreign Commerce and Revenue Laws, and now, as I have already stated Committee on Harbor and Shipping.

Q. What have been your duties during that time in relation to the com-erce of this port?

A. The duties of the Committees are quite important and take a great deal of time. The gentlemen who accept the duties of membership on one of the committees, to act on one of the committees, do so with the full knowe*l*dge that they have to give their time up to the interest of that particular branch of the business that that committee is called to act upon. In our case, I might say that for the last four months I have practically abandoned my own business and devoted time to the attention of the harbor and the commerce of this port which, unless it is protected, we will lose a good deal of it, and this question of our harbor—we have enough to contend with ourselves without getting any other foreign matter into our harbor. It is a very serious question, but that has been handled by other commissions and of course I do not pretend to pass on those questions.

Q. On what do you base your statement that you think this added pollution would interfere with the commercial prominence of the harbor?

340 Defendants' Counsel: The objection is that this witness is not qualified to testify and that the answer the question calls for is irrelevant and immaterial.

A. I think the emptying of our own sewerage is hurting our harbor and our commerce and our shipping. I think that is about the best answer that I can give and that has to be remedied. We have to remedy our own troubles at home.

Q. Do you know if any effort has been or is being made to remedy those home conditions.

Defendants' Counsel: Same objection.

A. Yes sir.

Q. State them if you know?

A. I know that the Commissions are at work and considerable is being done in that direction and I expect that before very long our Harbor Line and Bulkhead Line Commission will have to be thoroughly in touch with that particular matter.

Q. Your ability to answer these questions has been challenged by the defendants, Mr. Smith, on the ground that you are not qu*l*ai*l*ified to make these answers; will you state on what qualifications and experience your answers are based.

A. As representative of the Chamber of Commerce and as a member of the Committee of Harbor and Shipping I am here officially representing the Chamber. Personally—do you want an answer personally as well?

Q. Yes, sir, answer this as fully as you please?

A. Personally I have been connected with commercial business in the City of New York for upwards of 35 years, foreign trade involving an enormous amount of shipments to the South, and

in addition to that as a ship owner. I feel that I am
341 fairly well qualified to represent the Chamber or anybody or the State of New York in matters pertaining to the harbor questions. Questions that belong to experts and purely expert questions of course will take care of themselves, but from my thirty-five years' experience I feel that I am qualified in answering any questions that involve harbor lines, bulkhead lines and the emptying of the pollution into our river, causing the damage which it does, to say nothing of the deposits choking up channels.

Q. Endangering the health of every one that has to live on the water front?

A. Yes sir.

Q. You are a ship owner yourself?

A. Yes, sir.

Q. And have been for how long?

A. 15 years.

Q. Mr. Smith, how long have you ever conferred with me on the subject matter of your testimony.

A. I never had the pleasure of meeting you until just an hour or so ago.

Q. And you came in response to an instruction to the Chamber of Commerce?

A. Yes, sir.

Q. Mr. Smith, are you now connected with the Committee whose duty it is to look after the harbor conditions as to pollution?

Defendants' Counsel: Committee of what?

Complainants' Counsel: Committee of the Chamber of Commerce.

A. Yes, a committee will take that question up in its deliberations—you mean in the Chamber of Commerce Committee?

Q. Yes, sir?

A. Oh, yes. I thought you meant the State Commission.

Q. No, I mean the Chamber of Commerce Committee?

A. Yes, sir.

Q. You are a member of that Chamber of Commerce Committee now?

A. Yes, sir.

342 Q. And your interest in this matter has been continuing?

A. Yes, sir.

Q. As I have had no opportunity to confer with you, Mr. Smith, will you make any statement now that you think will aid in the investigation that we are having?

Defendants' Counsel: We reserve the right to move to strike it out.

A. I do not know that I can add any more than what I have stated.

Q. In what way does a polluted harbor impair or threaten the commerce of a harbor?

Defendants' Counsel: I object on the ground he has not yet qualified to testify.

A. That is quite a large question. I do not want to answer that right off hand because it involves many things.

Q. Are there any actual injuries to ships or craft which enter a polluted harbor that you know of?

A. Naturally. A ship lying anywheres near the discharge will find its bottom foul so that it requires docking and repainting, thus leaving aside the question of the health part of it.

Q. As a ship owner have you ever discovered that it impaired the health or working capacities of the crews?

Defendants' Counsel: I object to that.

A. I couldn't answer that right off.

Q. What can you say as a ship owner as to the injuries that proceed from polluted harbors, polluted waters?

Defendants' Counsel: I object to the question as too general and not material.

Complainants' Counsel: In your answer you set forth it takes the paint off ships going into the Passaic River, that it erodes the bottoms and strips vessels of their paint and this is the nuisance you are about to put in your neighbor's yard?

343 Defendants' Counsel: Here is the answer. You will not find any such statement. I object to the noting of the remarks on the ground that the record itself is the only evidence of what the record contains.

A. Danger to the hull, to the vessel, to say nothing of the danger to the health of the crew.

Q. Does a condition such as that impair the commercial uses of the harbor.

Defendants' Counsel: I object to that as it is a matter of opinion and the witness is not qualified to testify on that subject.

A. There is no question in my mind that it does.

Cross-examination by Defendants' Counsel:

Q. Now Mr. Smith, what damage is done to the hull of a vessel from a polluted harbor?

A. Quite recently a vessel had to be repainted by being in certain waters where the pollution seemed to do that damage.

Q. Where were those waters.

A. South Brooklyn.

Q. When had the hull of that vessel been painted before the repainting that you speak of?

A. Possibly six months.

Q. Was it your vessel?

A. Yes.

Q. What was the specific cause of the damage to the painting of the hull, if you know?

A. No doubt in my mind as to what the damage was caused by.

It was caused by this discharge containing whatever chemical action that discharge brought about on the bottom of the vessel.

Q. What was that chemical discharge that caused the damage.

A. I couldn't answer that question.

Q. Didn't you have it examined and investigate?

A. No, sir.

Q. So you don't know what the real cause of the damage was.

A. No, sir, my point was to get away from the harbor of New York as quickly as possible and up to clean waters.

344 Q. You have testified to injury to the health of the crews; can you point out a specific instance of damage to the health of the crews from pollution?

A. I cannot cite that, no, sir.

SERENO S. PRATT, called as a witness on behalf of complainants, being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. Are you connected with any of our great civic bodies here, Mr. Pratt?

A. I am secretary of the Chamber of Commerce.

Q. How long have you been connected with the Chamber of Commerce?

A. Since 1908.

Q. Have you been active in your *real*tions with that body?

A. Necessarily so, as secretary, I devote my whole time to it.

Q. You heard the last witness testify?

A. I did.

Q. You heard him state that he was instructed to come here by the Chamber of Commerce?

A. Yes, sir.

Q. Do you know that to be a fact as secretary?

A. Yes, sir, I asked him to come.

Q. Asked him in your capacity as secretary?

A. As secretary, yes sir.

Q. You have heard Mr. Smith's testimony and I now ask you, Mr. Pratt, if there is anything that you wish to add along the line of the questions that have been put to Mr. Smith?

Defendants' Counsel: I object to the question on the ground that it is too indefinite a question to indicate what is embraced in it and whether the answers would be relevant or not.

The Commissioner: Note the objection.

Complainants' Counsel: I withdraw that question.

345 Q. Mr. Pratt, have any committees been appointed by the Chamber of Commerce to make inquiry and take action relative to the pollution of these harbor waters?

Defendants' Counsel: Objected to on the ground that it is immaterial and irrelevant.

A. As Mr. Smith read you the record of the harbor and shipping committee being instructed to act in this matter December 3rd, 1908, and that Committee through its chairman, Mr. A. Foster Higgins, I know devoted a great deal of thought and attention to this matter. The Chamber has more than once taken action in regard to the sewerage question in the City of New York, the question of the disposal of New York City's sewerage, and has supported the appointment and the work of the Metropolitan Sewerage Commission.

Q. Are you familiar with the type of work done by the Metropolitan Sewerage Commission?

A. I should prefer not to answer that question because I am not an expert on the matter of sewerage.

Q. I did not mean to go into the expert feature, Mr. Pratt, but as to the object of the Commission's usefulness?

A. I have read their report, or a large portion of it, and I am in hearty sympathy with the work which they are doing. I think it is very important, and that I believe to be the opinion of the Chamber of Commerce.

Q. Have any Committees of the Chamber of Commerce acted in conjunction with the New Jersey authorities?

A. No, sir, not in this matter.

Q. Have there been any joint committees in regard to harbor pollution?

A. Not that I know of, no sir.

Q. Or in regard to the foreign commerce?

A. Not that I remember.

Q. Is there a Committee now of the Chamber of Commerce who have these questions in charge relative to the harbor pollu-
346 tion?

A. The Committee on Harbor and Shipping.

Q. Of which Mr. Smith is a member?

A. Yes, sir, and in the absence of the chairman, the present chairman, Mr. E. H. Outerbridge is acting as chairman.

Q. Are you prepared to give any answers to questions relative to the percentage of commerce, foreign commerce, done by the Port of New York?

A. The percentage is about 48%.

Defendants' Counsel: I move to strike the answer out as not responsive. The question is, is he prepared to do it, and I suppose the answer is yes or no to that.

Q. And if so state what the percentage is, add to my question.

Defendants' Counsel: I object on the ground that the answer to the question would be doubled and the relevancy and materiality of it might depend upon the answer to one of the parts.

Complainants' Counsel: Strike both questions and answers out.

Q. Mr. Pratt, what is the percentage of foreign commerce transacted at the Port of New York?

Defendants' Counsel: I object on the ground that the witness has not qualified to answer that question.

A. About 48% of the total commerce of the United States. The percentage varies from year to year. It has been greater than that and also less than that but that is about the amount.

Q. Will you state, Mr. Pratt, upon what knowledge and experience in relation to the Chamber of Commerce you based that answer?

A. I prepare the annual report of the Chamber of Commerce which contains detailed statistics regarding the commerce of the Port of New York.

Q. What factors would be most likely to impair the use-
347 fulness of the Port of New York as a port of entry for commerce?

Defendants' Counsel: I object on the ground that the question calls for an opinion from this witness and he has not qualified as an expert.

A. One of them would be the inability for ships to enter the port through the obstructions in the channel. Another would be a lack of terminal facilities. Another would be lack of proper transportation facilities for the goods when they arrive or the goods leaving here to be shipped abroad. There are many different factors which go to make up a great port. One of the most important is that of a large free channel leading from the docks and piers to the open sea, and the Federal Government is now engaged in completing what is known as the Ambrose Channel to a depth of forty feet and a great width so as to enable the largest ships afloat to reach the city.

Q. Does extensive pollution of harbor waters impair commercial prominence in Ports of Entry.

Defendants' Counsel: Same objection.

A. I don't feel qualified to answer that question, Dr. O'Sullivan, because I am not an expert on sewerage or its effect. I do not know beyond what I have seen from the reports of the Metropolitan Sewerage Commission. I prefer not to answer the question.

Cross-examination by Defendants' Counsel:

Q. When you speak of the waters of the Bay of New York what do you include.

A. All the waters properly. That would be from this side of Sandy Hook Lightship right up to the end of Manhattan Island.

Q. They include, do they not, the Bay of New York includes a large territory that has some connection with the State of New Jersey, hasn't it?

A. Certainly, the State of New Jersey has land adjacent to the Bay of New York.

Q. The commerce of the count-y, the large vessels that
348 come to the Port of New York, tie up, don't they, a large number of them, on the Jersey shore?

A. Yes, sir.

Q. And there is a long line of docks from the D. L. & W. Terminal northward, isn't there?

A. Yes, sir.

Q. And occupied by what companies?
A. Well, the Hamburg American Steamship Line and the North German Lloyd I know dock on the Jersey shore.
Q. And some others?
A. And some others, yes, sir.
Q. In other words they use the deep waters of the Bay whether they are in New York *on* in New Jersey without any regard to that for landing?
A. I am not prepared to say whether the waters are in New Jersey or not. That is a legal question that would be involved in the language of the United States Statutes I presume.
Q. You don't know whether they are or not?
A. No, I know the docks would be on the Jersey shore.
Q. Don't you know as matter of fact that a Commission established the boundary line between the State of New Jersey and the State of New York?
A. I have heard something to that effect but I do not know what the exact line is.
Q. And you don't know where the line runs?
A. No, sir.
Q. What proportion can you give of the commerce of New York that is loaded and unloaded on the shores of New Jersey?
A. I would be unable to give that. I do not think there are any statistics that would show that accurately.

Redirect examination by Complainants' Counsel:

Q. Mr. Pratt, how long have you ever conferred with me in relation to the testimony you have just given?
A. Perhaps one minute, in the other room.
Q. Was that the first time you ever saw me?
A. It was.

CHARLES B. PARSONS, called as a witness on behalf of complainants, being first duly sworn by the Commissioner, testifies as
349 follows:

Direct examination by Complainants' Counsel:

Q. Are you a resident of this municipality, captain?
A. I am not, sir.
Q. Where do you reside?
A. At Red Bank, New Jersey.
Q. Captain, are you connected with any of the large civic bodies in this city?
A. I am not at present.
Q. Were you connected with the Maritime Exchange?
A. I was a director for five years and I was president for four years ending in 1906.
Q. And when did you sever your relationship with the Maritime Association or Exchange?
A. About a year ago.

Q. And are you now retired from active business?
A. Yes, sir.
Q. Are you familiar with our harbor conditions here, captain?
A. I think I am, sir.
Q. And for how long have you been familiar with the harbor waters of New York Bay and its tributaries?
A. Well sixty years.
Q. Have you navigated these waters, captain?
A. I have.
Q. And was it any part of the duty of a navigator to note the conditions of the waters that he was steering his craft in?
A. I couldn't say that it was any part of his duty but it was a question which would very naturally attract his attention and particularly when it became offensive.
Q. I understood you to say just now, captain, that for sixty years you have navigated these waters, am I right?
A. For sixty years I have been more or less familiar with them.
Q. With the waters?
A. Yes, sir.
Q. Will you state what the present conditions of the harbor waters are and have been for some few years past?
350 A. I should say that the waters are very seriously polluted, almost to the danger point; that in the heads of slips and in the rivers and creeks that the vessels discharge their cargoes, the smaller class of vessels, the rivers are so polluted that it injures the paint, destroys the metal on the bottoms of vessels that are metal, and is a continual menace.
Q. Do you think it would remedy that condition to discharge 360 million gallons of sewerage a day into our harbor waters?

Defendants' Counsel: I object on the ground he has not qualified to answer the question and it is a matter of opinion any way.
The Commissioner: Note the objection.

A. I think any increase whatever would not only not remedy but would increase the injury.
Q. Are you familiar with the conditions in the Passaic River?
A. Not much above Newark, very little.
Q. What effect has the harbor pollution had on the fish industry, if you know, captain?
A. I have not been in any way connected in the fish industry consequently would not feel that I was qualified to answer that question.
Q. Did you at any time have a knowledge of the fish industry in connection with the Washington Market and the pollution in the nearby waters?
A. I have a very distinct recollection that the slips near Washington Market where there used to be fish cars became so seriously polluted that the men engaged in the fish business were obliged to remove their cars from that vicinity from the fact that people would not eat fish at the restaurants or buy fish from the market fearing lest they might come from that polluted water.

Q. Does harbor pollution interfere with the navigability of a harbor such as ours?

351 Defendants' Counsel: I object. He is not qualified.
(Question withdrawn.)

Q. I have addressed you as Captain Parsons; have you been a sailing master?

A. Yes, sir.

Q. State how long and what experience you have had; there is a question as to your qualifications to testify on navigation and navigable waters, captain, you understand my reason for putting the question?

A. I was Master of a seagoing coastwise vessel for 25 years. I was a sailor and mate for several years prior to that. My experience during that term of being Master was mostly between New York and our Southern coastwise ports, also including West India and occasionally European, but it brought me frequently to the City of New York, to the harbor.

Q. Are you familiar with the harbor waters around New York?

A. Yes, sir.

Q. And have navigated ships in those waters.

A. Yes, sir.

Q. I now ask you captain if the pollution of harbors impairs the navigability of channels and of the waters?

A. The navigability is impaired by the filling up of the harbors at the heads of slips and in the small bays and coves where there is no current. The greater the amount of discharge into the river the greater amount of sediment which deposits in those places to which I have alluded.

Q. Have you had any direct experience at any time with the effect of polluted waters on the paint of vessels?

A. Yes, sir.

Q. Will you state what that experience was?

A. Vessels going into Newtown Creek or into Gowanus Canal or lying up at the heads of some of the slips if they were painted white would in the course of two or three or four days turn black. I have one concrete instance. A captain in a vessel which I own arrived and went into Newtown Creek. He had his vessel
352 recently painted both outside and inside, inside white. I mean by inside the houses and the ways and he was very proud of the condition, so proud that he asked me to come over and see the vessel. Two days after he had been there I went over and there was nothing in evidence of which the captain might be proud. His white paint had turned black.

Q. And that was in the case of a vessel that you own?

A. Yes, sir.

Q. And when was that, about?

A. Well, I think that was about 1902 or 1903 or 1904, along there; I couldn't date it exactly.

Q. Is the ravages of pollution confined to the exterior of those ships or vessels?

A. Well it is mostly but it will turn the white paint black in the cabins.

Defendants' Counsel: What does that indicate to the witness "the ravages of pollution"?

Complainants' Counsel: This will later resolve itself into the question of oxygen percentages and the putrescent gases which will liberate hydrogen sulphide which does this blacking. We will come to that later, and the ravages of hydrogen disulphide are the ravages of putrescent gases and come from polluted waters.

Defendants' Counsel: I move that the remarks of counsel be expunged from the record on the ground it is not part of the evidence in this case.

Complainants' Counsel: I ask that they be retained there in answer to the question put to me by Judge Coult of the Defendants' Counsel.

Q. How does it affect the crews, captain?

A. In the first place it is very offensive to the smell. In the second place, while I do not know that I have had any personal cases of illness, I know that our men object to staying on
353 board the vessels while lying in those worse affected places and I have noticed that while men, the ship keeper, the steward or mate, who are the ones most likely to remain on board, very often after they have been in a few days ask permission to go home or have somebody relieve them.

Q. Have you any knowledge or experience of the effect of these putrescent gases on the metals of vessels?

A. I know that vessels going into Newtown Creek with a new coat of metal have received so much injury from it as to require remetaling on the other side where they delivered their cargoes of oil, and so well known did this injury become that owners ordering vessels to load at New York for European ports would exclude these most objectionable places.

Q. Have you known of cases where the chemcial action of these putrescent gases have perforated the metals?

A. Well, I have known cases where the metal showed the perforation. Now, as to the chemical reasons or chemical statement of that, that I couldn't give, but I know that a vessel going into Newtown Creek with good metal and which ought to last two or three or four years will have it ruined and perforated within one year.

Q. And I understood you to say that you are a ship owner yourself, captain?

A. Yes, sir, I have been.

Q. Have you given any thought and observation to whether or not the sewerage discharge in our various trunk sewers in this great city, whether it passes out on one tide or not.

A. I know it does not.

Q. Will you state as fully as you can, captain, on what observations you base that statement?

A. Well, I base it first upon our experience in navigating a sailing vessel from New York Harbor, say from Jersey City to sea with

a head wind, that we would be unable to make it in one tide. I would state that the Chairman of the Metropolitan Sewerage
354 Commission informed me that a float put in the water at the Battery at the first of the ebb tide would reach within six miles of Sandy Hook and then with the flood——

Complainants' Counsel: My friends are very kindly not objecting to just what you have heard. I am trying to confine you to your observations——

Defendants' Counsel: I did intend to move to strike it out because it was apparently not responsive to your question.

A. Then I will say from my own positive observation and knowledge that a vessel becalmed would not drift more than half or two-thirds of the distance from Jersey City to Sandy Hook.

Q. But have you in the course of using these waters as a navigator ever observed dead animals in the water?

A. Yes, sir.

Q. And how long *you have* noticed them coming and going with the tide; give us any observation on that line, captain?

A. Well, I have known instances of dead animals that went down in the Bay, came up again through the Narrows and then going down again would be landed on the shore of Staten Island or New Jersey.

Q. After how many days?

A. Well, I couldn't tell how many days.

Q. I mean that you observed?

A. The case where I have made observation, it was the end of the second day.

Q. So that one did not go on one tide.

A. No, sir.

Q. Have you been enabled at any *thime* to make observation on vessels that have sunk at the docks or anywhere in our waters with regard to the putrescent waste, sludge?

A. I know a vessel that sunk at the pier or anywhere around the harbor will accumulate in a very short period, in 24 hours or 36 hours, an immense amount of sediment, making the cleansing
355 of the vessel almost as much of an expense as that of raising it.

Q. Have you had any direct experience along that line yourself?

A. Yes, sir, I have been unfortunate enough to have a vessel sink in the harbor.

Q. As far as your observations go, captain, does this sewerage make deposits in slips or in the navigable parts of the waters?

A. Well, I would say that the more contaminated, the more filthy the water, the faster those places fill up and the depth of water decreases. I can't assign it to any other reason except that the water is filled with this material coming from the sewage.

Q. Have you ever noticed the dredging being done in Ambrose Channel or other parts of the harbor waters and as to the character of the material brought up, anything you can give us on that line?

A. I have seen the dredging done in the slips and I have upon

two occasions been down in Ambrose Channel while they were dredging and the material which came out of the slips was what I should consider without an analysis or close investigation to be the result of sediment coming from the sewage and that down in the Ambrose Channel exhibited the same evidences.

Q. How deep is the channel there, about?

A. Do you mean now?

Q. I want to get an approximate idea of the depth of Ambrose Channel both before and after the dredging so as to get some estimate of the thickness or amount of this deposit, approximately?

A. Before the dredging it varied from 8 to 10 to 20 feet and still more than that in some places. The depth now I understand is 40 feet.

Q. And this material as it was taken out in the dredges impressed you as the deposit from sewage?

A. A large portion of it, yes sir.

356 Q. Have you any knowledge of the effect of that sludge that was dredged out on the crews or on the machinery of the dredges?

A. Upon that occasion when I was on board of the dredge they told me—they showed me their brass work. It was cleaned every morning and would turn black in a few hours.

Q. Is there anything you can add that I have not brought out by questions and which is in line with the questions I have put to you as to the polluted condition of this harbor and as to whether or not that would not be grossly and dangerously aggravated by the addition of 360 million gallons of sewage a day from the Passaic Valley sewer?

Defendants' Counsel: The question is objected to as not specific, and on the ground that this witness has not qualified to testify as to the effect of any particular amount of sewage.

The Commissioner: Note the objection.

A. I think your questions have covered the main points of the case. I would state that the whole of New York Harbor and of Raritan Bay below is so thoroughly impregnated with this sewage matter that along the shores of the Raritan Bay where there is flat or sloping beach when the water is perfectly still that slope will be covered in two or three tides with as much as an inch of purely sewage matter. That disappears when the water is disturbed by the wind blowing or to the beach making little action. I give that to show that the pollution of the harbor here is not confined to the immediate harbor but all the water which comes in contact with it.

Q. How much added pollution would it withstand according to your observations?

Question withdrawn.

Q. Captain, how long have you conferred with me in relation to the testimony that you now give?

357 A. I regret to say I have never had the pleasure of meeting you until I find you here.

Q. And you have never conferred for a moment with me, have you, in relation to your testimony?
A. No, sir.

Cross-examination by Defendants' Counsel:

Q. You did confer with some person, did you?
A. Not for this occasion.
Q. Well, for some occasion?
A. On previous occasions.
Q. You have qualified yourself to speak?
A. Yes, sir.
Q. On the same line that you have now been testifying to?
A. I couldn't answer that, that I had qualified myself with any one.
Q. I take that back myself. Did you observe the cat that you spoke about that went our of the Narrows, did you see the cat, I want to find out whether it was a New York cat or a New Jersey cat?
A. The cat I refer to was a horse. The cat that you ask about was a horse.
Q. Didn't you speak of a cat?
A. No, sir.
Q. Didn't you speak of a cat in your testimony that went out through the Narrows?
A. No, sir.
Q. What was it, a dead horse.
A. A dead horse.
Q. Now, where did the horse come from?
A. The details of that incident where these, Judge: I was lying anchored just above the Narrows and it was perfectly clam and we saw this dead horse drift down by our vessel and upon the next tide we saw that same dead horse. I don't remember the pecularities about it, but I do remember that my mate and myself both recognized it as the same horse come back again past us.
Q. Who put that horse in the Bay?
A. I have no knowledge.
Q. You do know that they discharge a large amount of sewage in the Bay of New York from the City of New York, don't you?
A. Yes, sir.
Q. And where is it discharged, at what point?
358 A. At all points where the sewers empty into the rivers.
Q. And where do they empty into the river?
A. They empty all along at different points.
Q. At the foot of the piers?
A. At the heads of the piers generally.
Q. Sometimes in the slips?
A. Yes, sir, that is in the slips that I mean, between the piers and the upper end of the slip. There are some that empty under the pier and at the end of the pier. These are modern.
Q. Now, most of the vessels that you speak about that have been discolored by reason of this sewage or for some reason were vessels that were in these slips or near them, weren't they?

A. Yes, sir.

Q. And they no doubt were injured if they were injured at all by the discharge of sewage into the slips?

A. Yes, sir.

Q. Suppose New York should take it out or clean it, what would be the result?

A. The water would be purer, less contaminated. The method that some of us who have been interested in that question has been that we have advocated having the sewage treated in some way so that it was relieved of its impurities before it was emptied into the harbor and that will eventually be necessary.

Q. Suppose that was done now by the City of New York would there be any trouble with the water.

A. It would be a great improvement.

Q. Wouldn't that practically be a clear water bay?

A. Yes, sir, if no other was put in from any other source.

Q. What proportion of the sewage emptying into the Bay of New York comes from the City of New York?

A. I would be unable to give you the percentage but the larger portion of it.

359 Q. Now, it is true, isn't it, that the large body of the waters of the Upper Bay are practically pure water, of the Upper Bay?

A. By the Upper Bay do you mean the New York Bay.

Q. Yes, I mean the center of the Bay navigated by the ships coming in and going out of the harbor, is practically pure water, isn't it?

A. No, sir, it is not. All of that water in the harbor here is more or less contaminated with the sewage.

Q. How do you know that, have you made any tests of it?

Complainants' Counsel: He has just told you Judge, he saw them take the sludge out.

Q. I will find that out: how do you know that it is contaminated at the point where this discharge is going to be made in the Bay, how do you know that?

A. At that particular point?

Q. Yes?

A. From the fact that I know all the water as I said before in the Upper and Lower Bay is contaminated.

Q. How do you know they are contaminated?

A. Because wherever there is an opportunity for it to settle it shows itself. It will form a water line around a vessel where this sediment comes in contact with the vessel, if there is not tide enough to sweep it away.

Q. Now have you ever made observation at that point where this discharge was going out in the Bay to find out whether the waters were pure or were defiled there?

A. I have made no special observation in reference to that particular point.

Q. You have been speaking of the condition down at Gowanus Bay; there are large sewers emptying there, aren't there?

A. Where?
Q. In the Bay. Gowanus Canal, there are sewers emptying there?
A. Yes, sir.
Q. From Brooklyn?
A. Yes, sir.
Q. And it has been necessary from time to time to dredge them.
A. Yes, sir.
360 Q. Because they are filled in?
A. Yes, sir.
Q. Have you ever made any observation how far out from the shore that condition continues?
A. That condition continues out into the Bay as far as the water is uninfluenced by the current of the river.
Q. Do you know how far it goes out, have you ever made any observation to find out?
A. I couldn't tell you the distance but take the line of the west side of the current of the river, say from Red Hook.
Q. What is the depth of the Gowanus Canal?
A. The lower part of the canal, we send vessels there drawing about 11 feet, up above three or four bridges.
Q. Do you know what the volume of sewage discharged in there is?
A. I have no record of the volume of sewage. A large amount of money has been expended and recently put into effect in Brooklyn to purify the Gowanus Canal.

Redirect examination by Complainants' Counsel:

Q. I wanted to ask you one question, captain. Judge Coult has asked you if that sewage could not be purified; is it feasible for these various municipalities in Jersey to individually purify their sewage?
A. At Red Bank there was so much objection made to the condition of the river that we were obliged to adopt a method of purification and since that has been adopted there has been no complaint from the river.
Q. And you do actually purify your own sewage in Red Bank?
A. Yes, sir, the same I think might prevail in any municipality.

Recross-examination by Defendants' Counsel:

Q. The river that you speak of is the Shrewsbury, isn't it?
A. Yes, sir.
Q. What is the flow of the Shrewsbury?
A. The strength of the current do you mean?
Q. Yes?
361 A. At Red Bank it is about 1½ knots; below Oceanic it is about 2½ knots.
Q. What is the depth of it, of the Shrewsbury River?
A. The depth up at Red Bank is about five feet and it gets deeper as you get down the river.
Q. And what is the extent of it, the area of it in front of Red Bank?

A. Well, I should say it was pretty nearly half a mile wide at Red Bank.

Q. The largest part of it is very shallow there isn't it?

A. The largest portion.

Q. It is practically a tidal march largely?

A. Yes, sir.

Q. And the crude sewerage of Red Bank had been discharged into this stream?

A. Yes, sir.

Q. And it was spread over this low tidal marsh swamp?

A. No marsh.

Q. This shallow bay?

A. Shallow bay, yes, sir.

Q. And the objection that was made was from the residents and property owners along the shore?

A. Yes, sir, on both sides.

Q. Describe this purification plant you put in at Red Bank?

A. That I would be unable to do, but it is a chemical treatment where the sewage is all carried to this depot for treatment and then the liquid emptied into the river.

Q. You cannot from your own knowledge state what the process is of purification?

A. I do not know the name of the treatment or the kind, I only know this, that we had continual complaint and protest before that treatment was adopted but that since then there has been no complaint.

Q. And you have discharged the effluent from your disposal works directly into the river?

A. Yes, sir.

By Complainants' Counsel:

Q. And there has been no complaint since then?

A. None whatever.

362 Q. And you consider the purification plant a success?

A. Yes, sir.

WELDING RING, called as a witness on behalf of complainant, being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. Are you a resident of this city?

A. I am a resident of Brooklyn.

Q. What firm are you connected with in this city, Mr. Ring?

A. I am a senior member of the firm of Maher & Carow.

Q. What is your business?

A. Shipping merchants.

Q. How long have you been engaged in the merchant shipping business?

A. Personally about 40 years.

Q. Are you connected with any of our large civic bodies?

A. I am connected with the New York Produce Exchange of

which I was president for two years. Connected with the Chamber of Commerce which I serve on Committees; member of the Maritime Exchange. I think that's all except corporations.

Q. Have you served on any of the harbor committees of any of those bodies?

A. On all of them, for all of them.

Q. Have you been on the Committee on Piers and Harbor Improvements at all?

A. I have.

Q. What were the functions of that Committee?

A. A general improvement of the harbor.

Q. Did you have occasion to make observation and collect data with relation to pollution of harbors?

A. No, not personally.

Q. Did the Committee?

A. I think not as far as figures would go.

Q. Have you ever appeared before the Harbor Line Board of the United States Engineers in reference to harbor and river
383 matters?

A. I have on many occasions.

Q. Have you ever been called upon for your knowledge in these matters either at Washington or at Albany?

A. I have.

Q. Have you ever given any special attention to the question of sewage or sanitation in relation to large cities particularly those on our seaboard?

A. I have always studied and considered them with very great interest.

Q. Have you traveled in other countries to any extent?

A. I have.

Q. What countries?

A. Europe, China and Japan, Australia, New Zealand, India.

Q. Have you made any observations in regard to sewage or pollution of harbor waters in any of those countries?

A. I have.

Q. Are you now connected with the New York produce exchange?

A. I am a member of it.

Q. Do you still hold your membership in the Chamber of Commerce?

A. I do.

Q. Did you as a member of the New York Produce Exchange appear before the Harbor Line Board and enter protest on behalf of the New York Produce Exchange in 1908 with regard to this Passaic Valley sewer?

A. I did.

Q. Have you made any general observations relative to the condition of our harbor waters here?

A. I have.

Q. Will you state what they are?

A. I have been engaged in shipping for 40 years; we first loaded sailing vessels and then steamers. At first our piers were located

at from Pier 8 to Pier 14 East River. The small size vessels could load cargo there without difficulty but when we chartered larger ones very frequently it was impossible to load them complete except at high tide. The last of the cargo would have to be put in at high tide. Then the ship would sink in the mud, in the silt and
364 it would be the next high tide before we would be able to remove her from her berth and have her go to sea. With our steamers we have had the same difficulty in loading them in Brooklyn where at times they would be in the mud and it would be impossible to get them out until high tide.

Q. Have you noticed the character of that mud?

A. I have.

Q. How would you describe it?

A. Black, slimy, sticky substance, difficult to describe because it was——

Q. But I mean the source, what source would you think the deposit came from?

A. Very largely the sediment from the sewers.

Q. What is commonly called sludge?

A. Sludge as I take it comes from, particularly, from oil works and chemical works but this is the material that comes out of the sewers such as the sewer at the foot of Beekman Street because the slips there would fill very quickly.

Q. House sewage or house waste, the deposit from that?

A. I couldn't tell what it was except that it was the sewage that came from the sewer. I suppose it was a mixture of everything.

Q. To your knowledge are there any plants that will leave a harmless effluent that will not contaminate or pollute harbor waters?

Defendants' Counsel: I object on the ground Mr. Ring has not qualified as an expert on such matters at this time.

A. I know of such plants.

Q. Where, sir?

A. One at Adelaide, South Australia and the other at Melbourne, Victoria.

Q. Are you speaking of your own knowledge now, Mr. Ring.

A. Of my own knowledge.

Q. State what the condition in Adelaide was before the
365 instal-ation of a sewage disposal plant and afterward?

A. Before the sewage plant was established the method for—I hardly know how to use the proper term there, but there were no closets of any nature except earth closets. All the hotels, all the private houses were provided with those earth closets which were also very offensive and that material was carried out and disposed of in some way, I don't know how. All other surface material ran down into the street and was carried into the bay at South Adelaide. At that time the death rate in Adelaide was very high. It was a city subject to hot climate at times and the death rate at times would rise as high as 25 to 27 in a thousand. Just prior to 1889, when I last visited there, they had completed this trunk sewer extending some five to seven miles outside of the city

of Adelaide and it was then in operation. I think it had been completed about five or six years. All of this sewage was carried through this trunk sewer out on to what was known as the sewage farm. I saw the sewage passing through this canal with all the sediment, all the dirt, all the discoloration, and more or less offensive on its way out to the works. Those works consisted at that time of three large wheels looking very much like water wheels, very large diameter, in which this sewage was carried up on one side and passed through a stream which took out the coarser portion first. Then it went to the second wheel and the second screening took place and finally to the third. After coming out of the three there was no sediment perceptible of any kind. The water was as clear and pure as anything you can see and there was nothing offensive in it to either smell or taste.

Q. Have you tasted it?

A. Oh, you can taste it there very readily. They all said there was no danger in tasting it at all.

Q. Did you taste any?

A. No, I didn't taste any personally, and this solid portion was treated chemically and then used as a fertilizer. This fer-
366 tilizer was first used, a portion of it, for a fertilization of the sewage farm which belonged to the city. It made the farm extremely profitable and produced a revenue from that. Such portion as was not needed for the city farm was sold as a fertilizer to whoever wished to purchase. The net result of all of this solid portion, the sale of it, and the produce of the farm produced a revenue sufficient to pay not only the interest on the bonds that were issued for the purpose of establishing this plant but also left a small revenue over and above the necesary sum for the interest.

Q. Now, Mr. Ring, that statment is so interesting to me that I will have to ask you upon what you base that statement that this sewage disposal plant not only added to the comfort and welfare of the people but was actually run at a financial profit; I ask on what you base that statement?

Defendants' Counsel: Before he answers I would like to ask that that testimony, although interesting, be entirely stricken out as irrevelant and immaterial to the issue in this cause, and I object to the question on the same ground.

The Commissioner: Note the objection.

Complainants' Counsel: I press the question on the ground it is essentially relevant here because in these New Jersey communities themselves who are being coerced into entering this Passaic Valley trunk sewer scheme, many of them are contemplating having private sewage disposal plants, and one of the objections to that is they are not run profitably, and we will show now they are run in other parts of the world not only to the benefit of the health and welfare of the people but at a financial profit to the communities that are intelligent and enterprising enough to employ them.

Defendants' Counsel: That statement is objected to and I ask

that it be expunged from the record on the ground it pur-
367 ports to be a statement of fact and not founded on the record.

Complainants' Counsel: It is a statement of what I will offer to prove.

The Commissioner: Note the objection.

The Witness: I made the statement that prior to the establishment of this plant the death rate was 25 to 27; subsequent to that the death rate fell to 14 and 15 in a thousand.

Q. That was after the instal-ation of this sewage disposal plant or sewage farm I think you called it?

A. Yes, sir, sewage farm.

Q. Now, what I was interested in asking was on what did you base that statement that the sewage farm was run at a financial profit?

A. I was told that by people in Adelaide that took me out to see the farm and witnessed its operation. I also have documentary evidence to show it.

Q. What do you mean by documentary evidence?

A. When this matter came up, 1908 I think it was, I was very much interested and I wrote out to our resident agent at Adelaide and also at Melbourne and Sydney for particulars and they sent me quite a number of documents. Among them is this one—shall I read it?

Q. What document is that, these are government documents?

A. *Document* documents.

Defendants' Counsel: I object on the ground that these documents are not properly proven and that they are not properly authenticated for use in this cause.

Complainants' Counsel: I would say in reply I am not offering them in evidence. I am merely seeking the source of the witness' information.

Defendants' Counsel: He said he was going to read from
368 them. Strike out my objection if he is not going to read.

Q. Do these government documents support the statements that you just made as to the low death rate and as to the financial profit at which these sewage farms are run?

Defendants' Counsel: I object on the ground that the witness is asked to testify now to the contents of these documents and that the documents have not been proved and cannot be used for that purpose.

The Commissioner: Note the objection.

A. Not the death rate but the financial profit.

Q. In describing the sewage plant or farm at Adelaide you described the sewage being taken in a canal or trunk sewer?

A. Trunk sewer.

Q. To this point and then taken out—were they circular wheels or methods of that kind employed?

A. Almost like a Ferris wheel, taken up apparently in buckets and the water allowed to escape through these slits which took out the solid matter.

Q. I understood you to say that you say persons drink some of that effluent or taste it rather?

A. No, I didn't testify to that, that I saw them do it.

Q. That was merely hereasy about the tasting?

A. Yes.

Q. But did you see the effluent?

A. Yes, I saw it.

Q. What did it look like?

A. Water just as clear as crystal.

Q. Did you smell it?

A. Nothing to smell.

Q. I mean did you apply it to the nostrils?

A. No, I passed along the bank of the canal and saw where the water was flowing out and irrigating the various farms, walked along by the bank of clear water and there was nothing offensive in the least about it.

369 Q. Now I think you mentioned something about Melbourne; what do you know of the sewage disposal plant there?

A. When I first visited Melbourne conditions were the same as at Adelaide with only earth closets and all surface sewage running into the Yara Yara River. That is a somewhat crooked river and at that time the color of the water that was running down through the Yara I should say was just about the same color as that which runs down through the Passaic River, about as black as your hat and very offensive.

Q. You have seen the Passaic River?

A. I have seen the Passaic River very often. At that time when I first visited Melbourne there was an epidemic of Typhoid Fever which was attributed to sewage conditions.

Q. Give the year Mr. Wing?

A. I think it was 1889. The death rate I was told was high. Of course I could not verify that. I know I got out of Melbourne just as quickly as I could, as my business would permit and went to Sydney. I was afraid to remain there. At that time a sewage plant similar to the one in Adelaide was being erected for Melbourne at a place called Gelong, about 15 miles from Melbourne. This plant in due course was completed, put in operation and proved to work just as well and just as advantageously as the one at Melbourne, and I am informed that it is on a profitable basis.

Q. Through these government documents?

A. No, not through these, but through a gentleman who was recently here, or a couple of years ago and I discussed the matter with him.

Q. Do they use chemical treatment in their manipulation of this sewage on these sewage farms?

A. I presume it is a chemical, it is something added to the sewage to make it——

Q. Precipitate?

A. I don't know what the process is, I am not an expert.

370 Q. Have you seen the effluent from the Melbourne sewage plant?

A. No, I didn't see that.

Q. As a practical steamship man do you know anything about the sealing up of our harbor from sewage deposits?

A. I know that the slips between the piers do fill up very rapidly. Running from Pier 8 to Pier 14 it was necessary for us to have our piers dredged out every two or three years in order to get sufficient depth for the loading of our sailing vessels. The same conditions I understand, in fact I know, prevail at the Atlantic Basin.

Q. From your knowledge and observation in these sewage disposal plants that you describe can an effluent result from such treatment that will not pollute and that will not menace health?

A. If treated in the same way I should say it would; no difficulty at all.

Q. In the various countries which you have visited and which you have described here have you ever known of a case where a large number of indolent communities extending over 105 square miles of populous territory ever discharged in concentrated form the sewage of such communities at a given point?

A. No, I have not.

Cross-examination by Defendants' Counsel:

Q. Mr. Wing on what body of water is Adelaide situated?

A. Adelaide is not on any body of water. Port Adelaide is on a bay that runs up.

Q. Is it a land locked bay?

A. No.

Q. How deep is it on the average?

A. I have no knowledge.

Q. No knowledge?

A. Well I have only knowledge to this extent, that steamers drawing 26 to 28 perhaps 30 feet of water can discharge at Port Adelaide. How much deeper it is I have no knowledge.

371 Q. How far from the city of Adelaide is Port Adelaide?

A. Seven miles.

Q. And bad health and epidemics that you testified to occurred at the city of Adelaide did they not?

A. No, they occurred at the city of Melbourne.

Q. No epidemic and no bad health at Adelaide before this sewage disposal plant was put in?

A. Except the high death rate.

Q. The high death rate you say then was at the city of Adelaide?

A. City of Adelaide.

Q. How large a city was Adelaide at the time you are testifying about, if you know?

A. I wouldn't like to testify to that. My recollection now is about 150,000 inhabitants.

Q. This sewage disposal plant that was installed in connection

with the sewage at Adelaide was very largely a screening process, wasn't it?

A. Screening and chemical both.

Q. Are you a sanitary engineer, Mr. Ring?

A. I am not.

Q. Do you know of your own knowledge what chemical treatment was applied to the treatment of sewage at Adelaide?

A. I do not.

Q. Do you know of your own knowledge whether any chemical treatment——

A. Only by what was told me.

Q. Are you a medical doctor?

A. I am not a doctor.

Q. You therefore do not know what the cause of Typhoid is?

A. No, I do not, I wish I did.

Q. Well, you have said that Typhoid epidemic was due to the sewage at Melbourne, how do you know that?

A. I say it was attributed to that.

Q. Who attributed it to that?

A. The residents there.

Q. Haven't you so much knowledge as to know that Typhoid Fever is an intestinal trouble arising from what you put in
372 your stomach?

A. Not necessarily.

Q. You don't know that?

A. I know it is an intestinal trouble.

Q. Don't you know that the sewage and gases coming from it do not produce Typhoid Fever?

A. I don't know that.

Q. Do you know whether they do?

A. I do not.

Q. Now you have been testifying to the necessity of dredging out certain slips that were used by your vessels; will you enumerate what they were?

A. Between Pier 8 and Pier 14 East River.

Q. All of them?

A. Yes, sir, at different times.

Q. Do you know whether crude sewage including street wash was discharged into the heads of these slips?

A. I do not think any sewer empties into the head of any of these slips.

Q. Do you know where the sewers do empty?

A. Yes.

Q. Where do they with reference to those slips?

A. Foot of Beekman Street.

Q. With reference to the slips where does it empty?

A. To which slip?

Q. To the pier at the foot of Beekman Street where does the sewer empty?

A. I don't know, foot of Beekman Street.

Q. You don't know whether it empties at the end of the pier or at the head of the slip?

A. No, I don't know definitely.

Q. Now, did you ever have the silt that was dredged out of any one of those slips analyzed?

A. No.

Q. You never did?

A. No.

Q. Can you state what proportion of the matter taken out was sewage and what was non-sewage matter?

A. No.

Q. Do you know anything about the proposed process of treatment by the defendant, the Passaic Valley Sewage Commission?

A. Only as I have read it in the public journals and
373 heard it discussed at the hearings.

Q. You don't know what the character of the effluent will be from that treatment?

A. No, I don't know, I don't think any one knows.

Q. Do you know whether that effluent will produce any solid sedimentation?

A. Only that the parties admit that it will.

Q. I asked you whether you knew anything about it?

A. I don't know.

Q. Now have you in your extensive travels throughout the world examined any other sewerage disposal plants?

A. No.

Q. You never have examined those in Germany for instance?

A. No, I have not.

Q. Nor those in England?

A. No.

Q. You haven't happened to see the one outside of Bristol England?

A. No.

Q. And you don't know the effect upon the surrounding country?

A. I do not.

Q. Nor the character of the effluent from that?

A. I do not.

Q. Do you know of any reason why the processes adopted by Melbourne and Adelaide should not be adopted by the City of New York?

A. I do not know of any except the expense.

Q. Do you know what the quantity of discharge from the City of New York in the way of crude sewage is as compared with that of the City of Melbourne, for instance?

A. I don't know either side.

Q. Do you know the amount of crude sewage discharged by the City of New York into the Bay of New York?

A. I have read the statement but I do not carry it in my mind.

374 Q. Do you know what the present percentage of pollution of the total waters of New York Bay is by sewage matter?

A. I do not.

Q. Do you know what percentage of pollution would result from

the discharge of the proposed Passaic Valley sewage into the waters of New York Bay?

A. I do not.

Redirect examination by Complainants' Counsel:

Q. You were asked Mr. Ring if you knew what the character of the effluent from the Passaic Valley sewer would be; do you know whether or not there is a Passaic Valley Trunk sewer in operation now?

A. Not to my knowledge.

Q. And you could not very well be expected to know what the character of effluent would be before it actually existed and after its treatment?

Defendants' Counsel: Wouldn't that be a good time to commence the suit?

Complainants' Counsel: No, not for an injunction, not after the harm is done and you have driven us off this island.

A. I could not, I am not a prophet.

Complainants' Counsel: At this point, Mr. Commissioner, I would like an adjournment until tomorrow morning at 10:30.

Adjourned to June 27th, at 10:30 A. M.

375 Supreme Court of the United States, October Term, 1910.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWAGE COMMISSIONERS, Defendants.

299 BROADWAY, NEW YORK CITY, June 27th, 1911.

Before James D. Maher, Esq., Commissioner.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York.

William A. McQuaid, Esq., Deputy Attorney General, and

Dr. William J. O'Sullivan, Special Counsel, for The People of the State of New York, Complainants.

Edmund Wilson, Esq., Attorney General of the State of New Jersey.

Robert H. McCarter, Esq., of Counsel for the State of New Jersey.

Joseph Coult, Esq., and Adrian Riker, Esq., of Counsel for Passaic Valley Sewerage Commission, Defendants.

CHARLES T. SCHONDELMEIGER, called as a witness on behalf of Complainants, being first duly sworn, by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. Where do you reside, doctor?
A. 807 Clinton Street, Brooklyn.
Q. What is your profession or vocation, doctor?
A. A physician, surgeon.
Q. How long have you been a practicing physician?
A. Since 1882.
376 Q. Are you connected with any institutions for the treatment of disease?
A. I was President of the Long Island Throat Hospital and Eye Infirmary for the past 12 years.
Q. Are you still connected with it?
A. The property of the corporation was transferred over to the Brooklyn Eye and Ear Hospital on the last day of the past year.
Q. Are you connected with the Brooklyn Eye and Ear Hospital now?
A. I am a director in the institution.
Q. Have you been long a resident of this city?
A. I was born in this city.
Q. How long ago?
A. 1844.
Q. What part of the city?
A. Manhattanville, 125th Street.
Q. About where Grant's Tomb is now?
A. About there.
Q. Did you have any military connection with the forces of this country at any time?
A. I enlisted September 23rd, 1862.
Q. Did you serve through the Civil War?
A. Became a member of the 176th Regiment, New York State Volunteers.
Q. Are you connected now in any way with any of the Grand Army Posts?
A. I am Surgeon, U. S. Grant Post 327, G. A. R. of Brooklyn.
Q. Are you connected with any of the other veteran associations?
A. I am President of the Ironsides Veterans Association, a body formed of the Veterans of the 176th Regiment I referred to before.
Q. Are you connected with any benevolent or eleemosynary institutions?
A. I am Vice-president of the Allied Associations for the benefit of the Ridgewood Day Nursery.
Q. Is that a benevolent institution?
A. That is a benevolent institution.
Q. Are you connected with any of our civic bodies like Boards of Trade or anything of that kind?
A. I am Vice-president of the Broadway Board of Trade of Brooklyn.

377 Q. Are you connected with any other Board of Trade?

A. I am a delegate to the Allied Boards of Trade of Brooklyn. I am a member of the Brooklyn League. All of those associations have Committees on Health and I am a member of each one.

Q. As part of your duties on these Health Committees of these Boards of Trade did you at any time have occasion to investigate the pollution of our harbor waters?

A. I have interested myself especially in the waters of Jamaica Bay.

Q. State if you will, doctor, what conditions you found the waters of Jamaica Bay in?

A. Jamaica Bay is being polluted by the sewage flowing into it from the territory surrounding it, that is from Flatlands, Flatbush, New Lots and also from territory beyond the city limits, Jamaica, Far Rockaway and Rockaway.

Q. Are the waters very polluted now?

A. They are considered very much polluted because of the great inflow of sewage from an immense territory.

Q. Have you yourself had any unpleasant experience in relation to that sewage?

A. About a year ago I inspected the sewage which entered into Paerdegat Basin located in Flatlands, and while there I was bitten by mosquito-s, the first that I had noticed up to that time of the season, and it occurred to me while I was being bitten by them that possibly it might result in infection. This was on the 7th of June, 1910, and within a few days following the left side of my neck and face became very much inflamed, the glands enlarging and I was suffering great pain. I did not recover from this condition until about four weeks. I would like to note here the fact that a number of deaths have occurred in Flatbush in that vicinity from mosquito bites. I would like to state further that the sludge from the sewage entering into the bay covered the banks of the basin.

Q. And was it the mosquito-s in the neighborhood of that sludge whose bite infected your neck.

378 A. I have not the least doubt about it.

Q. And you state that as a physician?

A. I state that as a physician.

Q. Have you investigated or made examination of any of the sewage disposal plants either at Jamaica, Elmhurst, Saratoga or Far Rockaway, or those in Brooklyn like Hendrick Street, Manhattan Beach, Garden City, any of those disposal plants?

A. I have visited them all as you have mentioned them.

Q. Have they got a disposal plant at Jamaica?

A. The Jamaica disposal plant is located about midway between Jamaica and the Bay. I will correct that somewhat; it is nearer to the Bay but it treats the sewage from Jamaica.

Q. And it is now in operation.

A. And is now in operation.

Q. Is there a sewage disposal plant at Far Rockaway?

A. There is.

Q. And is it now in operation?

A. To the best of my knowledge it is. It was last year.

Q. Is there a sewage disposal plant at Hendrick Street in Brooklyn?

A. There is at the foot of Hendrick Street.

Q. And is it now in operation?

A. Now in operation.

Q. Is there a sewage disposal plant at Manhattan Beach?

A. There is.

Q. And is that in operation now?

A. It was last year.

Q. You do not know whether it was this year or not?

A. I do not, I have not been there. That is a private disposal plant you refer to.

Q. Is there a disposal plant at Garden City?

A. There was three years ago.

Q. You have not seen it in three years?

A. Not since then.

Q. Have you seen the disposal plant at Elmhurst?

A. About that same time, three years ago.

379 Q. Did you make any examination or observation in regard to that disposal plant at Elmhurst?

A. I made observation of all of the disposal plants we have spoken of.

Q. Taking the Elmhurst one, doctor, what would you say of the effluent after it had passed through the sewage purification works at Elmhurst?

A. The water as it flows away from the plant is as clear as water which we drink on the table.

Q. Can you describe the processes employed at Elmhurst?

A. I shall endeavor to to the best of my memory. The sewage enters the plant and is received by large tanks which are for the purpose of precipitation. While the sewage is passing through the tanks it goes slowly and the solid material contained in this sewage become deposited at the bottom. The flowing material is retained by appliances that keep it back.

Q. In the nature of screens?

A. No, not as screens—possibly that may be correct. The oily and other materials that float are kept back by the obstruction and then is withdrawn from the surface as it has accumulated. Then the body of the liquid is permitted to flow into large tanks on the outside of the plant. These tanks are in the open and are made purposely to strain or filter the sewage. They are really excavations on the top of the ground and prepared beneath with layers of sand and broken stone through which, there being several stratas, through which the sewage passes and finally reaching the bottom is carried out through pipes at the bottom of the plant and flows off into, I believe, Flushing Bay.

Q. You have seen the effluent after this treatment that you have described?

A. I have seen the effluent.

Q. And you have described it as being as clear as crystal?

A. As clear as clear water.

Q. Do they use chemicals in the treatment at any stage?

380 A. I do not believe that they do. The sludge from the bottom of the tanks when they are cleaned is incorporated into the coal and is burned with the coal.

Q. Then they use the sludge as fuel at Elmhurst?

A. As fuel.

Q. Now, doctor, what would you say as to flies at the Elmhurst plant?

A. I was surprised at their absence there. A very few, if any, that I could see.

Q. Were there any offensive odors that you could detect in the neighborhood of the plant?

A. Slight.

Q. Very slight?

A. Very slight—on the inside. None outside that I could detect.

Q. Are you still on any of the committees on these Boards of Trade that you describe and is your interest still continuous in the harbor conditions?

A. I am.

Q. And is your interest continuous?

A. It is.

Q. Can you make any statement relative to the general condition of the harbor waters as to their pollution or otherwise?

Defendants' Counsel: It seems to me that is quite general. I object to the question.

Complainants' Counsel: It would be answered by yes or no.

A. Yes.

Q. Is such knowledge due to direct observation made by yourself?

A. It is.

Q. Will you state what facts you apprehended with your sensory organs in regard to the harbor water pollution?

A. I would like to state in my earlier years I lived in Gowanus. I remember in the early fifties when fishermen caught fish in seines.

Q. In the Gowanus Canal?

A. The bay then extended—reached up to Third Avenue. I remember when in the early fifties passing down the em-

381 bankment at Third Avenue and at about 28th Street, where 28th Street would be now, one was within a stone's throw of the waters of the Bay. We boys went bathing there, went fishing. I remember treading for clams and oysters, catching crabs, soft crabs, and selling them to men who went fishing, for bait. This was near to Gowanus Canal. I lived within a stone's throw from the canal in those years when on the right bank entering the canal it was marsh land, it was not a basin in the sense that it is today, and fishing right in that neighborhood and around was a daily occurrence. I remember treading for clams right near where Hamilton Avenue is passing over from Smith Street to Third Avenue, and my

remembrance of the water in those days was that of being clean, pure salt water, with abundance of fish and fish food.

Q. Is there any fish in the Gowanus Canal today, doctor?

A. If I am permitted I will make this statement, that it was given out that there was not any oxygen in the waters.

Defendants' Counsel: I move to strike that out as hearsay.

Complainants' Counsel: This witness is a physician. Do you insist on striking that out?

Defendants' Counsel: I think it should go out. I do not think there should be on the record a hearsay statement of that sort.

Complainants' Counsel: I consent.

Q. Doctor, do you still retain your interest in the condition of Gowanus Canal?

A. No.

Q. Do you know that our city has made efforts to purify its present condition?

A. I am interested in the general condition of pollution of the waters surrounding the City of New York and contained within the City of New York, not specially concerned in a locality with the exception, perhaps, of Jamaica Bay.

Q. Now as to the general condition of the harbor waters
382 that you mentioned, state of your own knowledge what you know relative to that?

A. I believe that the waters of the Bay are very much polluted. I know they are. On the 11th of May I went over to Hoboken to see a friend of mine who was leaving on a vacation to Europe. After the steamer America had left the pier I was much suprised at the dirt, filthy condition of the waters then and there.

Defendants' Counsel: Do you mean at Hoboken, doctor?

The Witness: Hoboken. I saw what appeared to be a carcass of a dog, a lot of decayed material, fruit, rags, straw and the water was black.

Q. Any peculiar ordor from it, doctor?

A. An apparent ordor.

Q. Have you made observations at any other portion of our harbor waters?

A. I have seen the sewage as it came out of sewers flowing into the rivers, East River and I was surprised at seeing boys in bathing not far from where these sewers emptied. I have noticed the same condition on the Brooklyn side of the East River. The water is foul and very much polluted by sewage.

Q. Would you consider it safe to bathe in our harbor waters under their present condition?

A. Not at all, sir.

Q. What dangers would you apprehend?

A. I have treated affections of the eye that I am positive came from bathing in the waters of our bay.

Q. Troubles like conjunctivitis?

A. Exactly.

Q. Which you traced to bathing in those waters sewage polluted?

A. I know that sewage is emptied into those waters.
Q. And you regarded it as the source of infection, didn't you?

Defendants' Counsel: He has not said so.

383 A. Yes.

Complainants' Counsel: I understood he had.
A. (Continuing:) I have no doubt about the danger of bathing in waters polluted by sewage.
Q. With the large amount of organic matter which you describe in our harbor waters will certain infectious germs live and propagate in those waters under the temperature that we have in these warmer months?
A. I have no doubt about it.

Cross-examination by Defendants' Counsel:

Q. Doctor, all the sewers that you have testified to having observed discharged matter from the territory of the State of New York, did they not?
A. State of New York.
Q. How large a place is Elmhurst?
A. I would like to make the exception of Hoboken.
Q. Withdrawing that question, did you see any sewer discharge at Hoboken?
A. I did not.
Q. Do you know whether the matter that you observed had been thrown in from the banks or had been thrown from the vessels in the piers?
A. I do not.
Q. How large a place is Elmhurst?
A. I cannot tell you.
Q. About how large—10,000 inhabitants?
A. I cannot tell you how large it is.
Q. Did you make any analysis of the effluent from any of these disposal plants?
A. I did not.
Q. You therefore do not know the character, chemical or otherwise, of the effluent?
A. I do not.

By Complainants' Counsel:

Q. You made no chemical or other tests of the effluent?
A. I made no tests but I have two samples in my office, one of the raw sewage and the other sewage treated by a chemical. The chemical was used, however, for the purpose of hastening precipitation of the solids contained in the sewage. It is apparent that the sewage which has been treated by the chemical used becomes
384 clearer than that untreated, but the amount of deposition is the same.
Q. Elmhurst is a summer residential section, isn't it?
A. It is a suburb, I believe.

Q. There is a floating population attracted there in the summer time in addition to the regular population which stays throughout the year, is that a fact?

A. It must be inhabited by a number sufficiently great to suggest the desirability of a disposal plant.

Defendants' Counsel: What number is that, can you state that, it must be you said a sufficient number.

The Witness: I do not know the number. I went there to see the plant. I do not know of the town only as I passed through it then and since then.

By Defendants' Counsel:

Q. May I ask who solicited you to come here to testify?

A. I volunteered to come after being informed by a gentleman from the Assistant Corporations — office, as I understood, Dr. O'Sullivan, and I would like to make it plain here the reason why as I understood the gentlemen from the office came personally was because I had no phone and there was no way of reaching me in that way.

By Complainants' Counsel:

Q. Doctor, did you represent the Brooklyn Board of Trade, the Broadway Board of Trade of Brooklyn and the Allied Boards of Trade of Brooklyn at a hearing held before the Harbor Line Board in December, 1908?

A. I did.

Q. And were you informed that that was how the value of your testimony was needed to be used in the present hearing?

A. So I understood.

Q. Are you receiving any compensation for the testimony
385 you gave here today?

A. No, sir, I have been working for many years in the interest of charity hospitals and the like, You folks do the same.

By Defendants' Counsel:

Q. Doctor, you have testified that germs must be developed from the organic matter discharged into the Bay, the waters of New York Bay; have you ever made any tests yourself for the purpose of determining?

A. I have not.

Q. You have made no tests?

A. I have made no tests.

Q. Then do you know as a matter of fact whether there are any pathogenic germs actually developed in the waters of New York Bay from your own knowledge?

A. From my own knowledge I remember a case of Typhoid that followed the eating of raw oysters taken from Jamaica Bay last winter. Of my own knowledge I know that in my neighborhood of Brooklyn people are careful about the fish they purchase, that it does not come from Jamaica Bay. Jamaica Bay is in the City of New York.

Q. Is that all that you know about the development of pathogenic germs in the waters of New York Bay?

A. What I do know is not from personal analysis of the waters of the Bay.

Q. You have been practicing medicine in this neighborhood for nearly thirty years, haven't you?

A. I have.

Q. And with those exceptions that you have mentioned, that one exception, have you been able to trace the origin of any pathogenic germ to the waters of New York Bay, yourself, in your own experience?

A. I have not but I have observed this: last summer I hired a rowboat at Jamaica Bay to investigate the sewage as it entered into the waters of the Bay from the flume which extends from the disposal plant at the foot of Hendrick Street and observed the sludges that passed into the Bay contained in the sewage, the banks where this sewage entered being covered with sludge, and a flock of
386 snipes, quite a great number, walking on the surface of the banks composed of this sludge. It occurred to me at the time that hunters shooting snipes might shoot one of them and the bird being eaten cause trouble.

Q. That is assuming that there were pathogenic germs in that sewage matter?

A. Assuming that.

Q. Did you discover whether there were or not?

A. I did not, but the odor there was extremely offensive.

Q. Now, doctor, is it not a fact that the germ of Typhoid Fever could be generated in an oyster from other causes than sewage?

A. I don't know.

By Complainants' Counsel:

Q. Well, do you know doctor, whether or not Typhoid germs are generated spontaneously as a matter of medical knowledge, don't you know that they are not?

A. I know that.

Q. And that if you find Typhoid germs in an oyster they have to come to that oyster after having passed through the intestines of some human being?

A. Exactly.

Q. And the usual mode to convey those germs is through sewage?

A. Exactly.

Q. Isn't it a fact, doctor, that Typhoid Fever has been endemic in this city for many years?

A. That is a fact.

By Defendants' Counsel:

Q. Do I understand you to say that a diseased condition of an oyster might not produce Typhoid Fever independent of any such discharge?

A. You do understand me.

Q. That is a scientific fact, is it, that a Typhoid germ cannot be

developed in any oyster through a diseased condition of that bivalve arising from other causes than sewage?

A. You understand me correctly. I would like to state this fact. In conversation with old residents of Carnesie on Jamaica
387 Bay, men in the fish business, whose vocation was in the sea food line, and others, they have remarked that the fish of today are not the fish of years ago in their palatability and taste.

Mr. Coult: Did the old ladies around the market tell you that, that the fish did not taste the same as they did when they were young, is that the idea?

The Witness: Not the old ladies, these were the old men.

EDWARD HATCH, JR., called as a witness on behalf of complainants, being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. What is your full name?
A. Edward Hatch, Jr.
Q. Where do you reside?
A. Brooklyn.
Q. Have you been long a resident of this city?
A. Yes.
Q. How many years?
A. About 30, 35.
Q. Are you connected with any of the civic bodies of this city, Mr. Hatch?
A. Yes, sir.
Q. Will you name any of them?
A. Merchants Association and American Civic Association.
Q. Have the Merchants Association as a body taken any interest in the condition of our harbor waters?
A. Yes.
Q. And what form did that interest take?
A. I was appointed Chairman of the Committee on pollution of the waters of New York.
Q. And when was that pollution Committee of the Merchants Association first organized?
A. 1906, five years ago.
Q. And what action did the Committee take as the result of that interest and of their being organized by the Merchants' Association for that given purpose?
388 A. It was to look into the matter of the pollution of the harbor and the waters adjacent and also take up the matter of the Hudson River and other streams up state. The idea was to begin with the waters immediately around the metropolis, and as there were two sewers to be built that were to add to the pollution of the harbor, the Bronx sewer and the Passaic Valley sewer, our efforts were directed in opposition to them. We started with the Bronx sewer and after we started that then we started in with the Passaic Valley sewer, and of course we have done other work in

connection with it, but these were the two main outrages that we considered as such.

Q. What work or investigations were conducted by that pollution committee of the Merchants Association with a view to determining the condition of the harbor waters and what it would mean to have this great accession of sewage threatened by the Passaic Valley Sewage Commission?

A. Of course it was well known that at present the waters were already polluted by New York and Brooklyn and by a population of over a million people up through the Hudson River Valley, as far up as Hoosic Falls and then coming down, Troy, Albany, Hudson, Poughkeepsie and all intermediate towns and villages which added of course the pollution of a million of inhabitants and over besides all the drainage from the farms.

Q. Did the activities of that Commission cause it to make investigations north of the city on the Hudson?

A. Yes, we did that later on.

Q. Now, Mr. Hatch, will you please describe just what work has been done, how it was done?

A. A survey was made of the harbor, of the Passaic Valley, of the Passaic River and the Kill von Kull, Raritan Bay, Gravesend Bay and the East River and I investigated it myself personally, most of it. The question then came up and some of the sanitarians, among them Mr. Herring and others said——

189 Defendants' Counsel: I object to what people said. Have these engineers here if they are going to testify against us.

A. (Continuing:) Well, it was determined as additional evidence to investigate immediately Manhattan Island in regard to the flies as disseminators of disease germs which they gathered from the sewage. That was done in order to show that the sewage contained germs which the flies carried to the food stuffs and to market and all sorts of edibles that are brought into the city. They are marketed along the shore, that is along the water front, in the various markets, and the flies, as was determined by our investigation, which covered every slip of Manhattan Island and Brooklyn, showed that sewage gave up the germs to the flies who disseminated them. That was to show that it was already polluted. We have been very active in having New York get in line, but New York, or Manhattan Island, for the last several hundred years has been developing and the sewers have been growing from time to time in a natural way and in accordance with the development of the island, but these propositions were entirely new. They had no access, at least they had no right of access, as we thought, into the harbor waters and more especially the Bronx sewer, which is audacious beyond question. The Passaic Valley sewer, or at least the Passaic Valley, the sewage from that Passaic Valley district was brought down into Newark Bay and there a sedimentation and some septic action took place so that at the time it reached the harbor through the Kills it was not so dangerous perhaps as it would be if it was brought direct to the harbor there at Robbins Reef. The Bronx sewer we fought through the courts and

several suits are now pending, and some of the tax payers of the municipalities that are joined in this contract—well that is not relevant here—that is up to the present point.

Q. How far up the Hudson did the investigation of that
390 commission take its activities?

A. Well, we went up as far as Fort Edward. Then we examined the ice at one time and found that that of course brought up the polluted condition of the river all the way down. We have all that data, the result of the investigation.

Q. How long did the investigation relative to infection from flies continue, Mr. Hatch?

A. 1906 I think we made our report; 1907 it was made and we reported in 1908.

Q. Did the Committee agitate for the formation, organization or appointment of a commission delegated by the State to make investigations in these matters?

A. I believe the Merchants Association did advocate the Metropolitan Sewerage Commission's existence.

Q. And do you know of your own knowledge whether or not a pollution commission was appointed by the Governor of this state to investigate the conditions complained of?

A. Oh, yes, Governor Odell,—it passed the Legislature, it was a legislative bill, there were three commissioners. A commission was appointed. The Legislature enacted the statute and then the Governor appointed these three or four and then the life of the commission was continued on two different occasions or three.

Q. An enactment created a commission and the Governor appointed commissioners, it that it?

A. I believe the Mayor appointed the commission after the Governor signed the bill.

Q. In the first instance was it the Mayor or the Governor?

A. I think it was the Mayor.

Q. And was that the commission or committee delegated to investigate harbor conditions, watch the investigations and work of the New York Bay Pollution Commission which you have described?

A. Yes, sir.

Q. Have they kept in touch with the work done by them?

A. The work has been going on. There has been an ap-
391 propriation of $75,000 the last time I believe for it, and sufficient funds before except on one commission.

Q. And has this Merchants Commission kept actively at work during the various years you mention?

A. Yes.

Q. And has it interested itself in legislation and other matters in furtherance of the object of cleaning the harbor?

A. Yes.

Q. Have you yourself investigated the feasibility of sewage disposal plants?

A. I have.

Q. Will you describe what plants you have visited and what your observations of the working of these plants were?

A. Well, I visited the plant at Saratoga several times, I am quite familiar with that.

Q. How do they treat sewage there?

A. Septic tanks, filtration. Then the effluent is pure water, absolutely pure.

Q. Have you ever seen anybody drink it or taste it?

A. Yes, I have drunk it myself often and several of us have drunk it.

Q. You say you drank some of it many times and had no ill effects from it?

A. No.

Q. How did it look to the eye?

A. Perfectly clear.

Q. How did it taste?

A. Just like water, little bit flat. There was not any life in it, as there is in some water.

Q. Any odor?

A. None at all.

Q. About the plant itself was there any unpleasant odors or flies?

A. No there was no unpleasant odors except where the sewer entered. In the first tank there is filtering. Sometimes when the wind is in the right direction you might catch a slight odor but there is nothing objectionable about it. That plant up there treats the sewage of a normal population of about 15,000 and then in the summer time when the visitors are there there are from forty to fifty thousand of course there are about twenty beds and these extra
392 beds are used in the summer time. Of course the sewage at a resort where mineral water is drunk the way it is there the sewage is worse than it would be any other place because people are there for the purpose of cleansing their body and the discharges are perhaps more copious. They are worse. The only disadvantages there, in the first place they were using 400 gallons per capita per day of water and it was a tremendous waste, a very large waste of water. For every gallon that they treated it took so much area and so much room so they went to work and metred the town at a cost of about $50,000 and they reduced the water consumption to 100 gallons per capita per day, and that would be a great advantage at the present time for New York to adopt some method like that, and in Newark also, I guess—I don't know what your per capita is out there. It was metred and of course that was an obstacle to first overcome. Then they had to lift it 40 feet. They had to pump it, which they do by automatic pumps and discharge it on these beds and whatever—and what was rank sewage in the sewers one day, in 24 hours it would be pure water, better water I guess than anybody here ever drank. I never drank such pure water. I have heard it stated and seen the reports where it is 99 and a fraction degree of purity. They never have any trouble. It is inexpensive. I do not think it costs them over $2,000 a year to run the plant. Of course the population increases up to 50,000 say from the middle of July to the 5th of September or something like that.

Q. Have you investigated any sewage disposal plants in other countries?

A. No.

Q. In other parts of this country?

A. Yes, White Plains and Tuckahoe. I have investigated others but they are all of a similar nature, so that I always considered the plant at Saratoga an ideal plant because it accomplishes nature's purpose and otherwise if nature did not have some process like that we would be reeking in our own filth. It is simply that the septic tank is an idea of making the environment such that nature
393 can go on with these processes which are prominent in our make up.

Q. I understood you to say that part of the investigations of the commission dealt with the condition in the Kill von Kull and the other end of the Passaic River?

A. Yes, sir.

Q. Will you state what the result of those investigations were, Mr. Hatch?

A. I am familiar with the Passaic River from my boyhood and I have noticed it all along from time to time. I lived in Newark for some time and I lived on the Passaic River toward Arlington and I was a boy at Rutherford Park when the condition of the river was such that when I was a very small boy I remember catching shad and I remember it for several years, for a number of years, and gradually this infectious matter and the increase of population so polluted the river that I have not heard in the last two years of a fish being caught there and I have made several efforts to. Of course I don't know what good the fish would be. I do not think even eels, which are the scavengers of all water bodies, I do not think they can live there, but there is no question about the pollution of the Passaic River.

Q. Are you familiar with fish as they existed in those waters, those harbor waters for many years past?

A. Yes.

Q. What effect has the polluted condition of those waters had on the major fish life?

A. Well the fish that are caught, shad caught just this side of Yonkers, that is before the Bronx sewer emptied, were so impregnated with sewage and oily taste that it could not be eaten and they could not be cooked because they filled the house, that is a small house where the fumes could go through with the odor of the pollution. Fish do manage — baffle the pollution and get up the river way up above Peekskill where it isn't so bad, but that is only in the Spring of the year when there are heavy floods
394 The Acquarium used to take their water from the river but the mortality of fish was such that they had to go outside with tank steamers and bring it from way out at sea and now they have a process by which they use the same water over and over again by filtration.

Defendants' Counsel: That is the local Acquarium at the Battery?

The Witness: Yes, sir, at the Battery.

Q. Have these investigations occupied much of your time and attention for the past few years, Mr. Hatch?

A. Yes, considerable.

Q. And were your time and attention devoted to these objects as a public spirited individual or for compensation ?

A. Entirely, no compensation, it was a parental wish that I should carry it on and I have done it.

Complainants' Counsel: I would like to interrupt the examination of this witness at this point. I have two other witnesses to put on.

AMOS L. SCHAEFFER, called as a witness on behalf of complainants being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. Where do you reside, Mr. Schaeffer?

A. 2271 Loring Place, in the Bronx.

Q. Have you ever met me before you met me in this room a few minutes ago?

A. No, sir.

Q. Are you connected with any of the city departments?

A. Yes, sir.

Q. In what capacity, Mr. Schaeffer?

A. As Consulting Engineer to the President of the Borough of the Bronx.

Q. And have your official duties in any way brought you in contact with the condition of the waters with what is known
395 as the Bronx River?

A. Yes, sir.

Q. State what the condition of the Bronx River is; first state where it rises and where it discharges and then what its condition is?

A. The Bronx River discharged into the East River I should say a mile and a half east of Hell Gate. Its source is at some point above White Plains, I can't tell exactly where, but so far as pollution is concerned there is pollution only below the Kensico Dam and the outlet in the East River. Of course the water above that point is used for domestic uses for New York City.

Q. And what is the condition of the Bronx River as to pollution and from what source is it polluted?

A. The waters of the Bronx River are generally foul even under comparatively favorable conditions. For instance I passed along a portion of it in the Zoological Park and just above the bridge at the Boston Road it is covered with skum, after all this great rainfall that we have had during the past few weeks. The condition generally along the river as far as White Plains is practically the same. I do not know what all the sources of the pollution are. There are several sewers discharging into it. There are two in the Borough of the Bronx. As to the exact location of any others I do not know those but it is my understanding that there are other sewers which discharge into it further north.

Q. North of the city line?

A. North of the city line.

Q. And your duties relate entirely to that part of the city in the Borough of the Bronx?

A. Yes, except that recently it became my duty to prepare a report on the request for corporate stock by the Bronx Parkway Commission for the acquisition of land and improvement of it to remove the pollution of the river. This commission exists by an Act of the Legislature of 1907. The request for funds was made to the Board of Estimate of the City of New York and the
396 Comptroller and the President of the Borough of the Bronx were appointed a committee to look into this matter and as the Consulting Engineer to the Borough President I investigated the entire length of the river and reported on the conditions and on what would be a good method of removing pollution.

Q. In other words there is a commission now appointed for the purpose of purifying that river?

A. Yes, sir.

Q. Establishing some scheme of purification for the sewage?

A. Yes, sir.

Q. Are you familiar with any parts or of the condition of the Hudson?

A. No. I am familiar with the Hutchinson River, that is a small river which discharges into the Sound at Pelham Bay, and has its source somewhere up in Mount Vernon beyond the city line and it is used as a navigable stream through the Bronx and into Mount Vernon. I had occasion to go through it last summer and it is exceedingly foul. In fact at the end of navigation it is almost mud, even to the surface, and there must apparently be a great deal of decomposing matter at the time because it is very foul to the smell and this decomposing matter and gases constantly bubble up.

Q. Where did you notice these putrescent gases, did you say?

A. At the head of navigation but the conditions are the same further down the stream.

Q. What stream was that?

A. The Hutchinson River.

Q. That is outside the city limits?

A. Partly only. Its source is in Pelham Bay Park.

Q. Does that river run near Mount Vernon?

A. Yes, the upper end of navigation is in Mount Vernon.

Q. And there is a purification of sewage disposal plant at Mt. Vernon is there not?

A. I think there is, I would not be sure about that.

397 Q. Are you familiar with the conditions in the Harlem River, Mr. Schaeffer?

A. Yes I am to some extent.

Q. What are the conditions of the water there as to pollution?

A. The conditions are bad. They are not as bad as they are in the Bronx River or in the Hutchinson River. At this point perhaps I might say that I do know a little something about the Hudson River also. Last Fall I was present in a trip of inspection

that was made by a number of engineers of this city as the guests of Col. Black of the War Department and a trip of inspection was made of the water front of New York City for the purpose of seeing what the conditions of the waters were. The Hudson River showed comparatively little pollution. Considerable pollution exists in the Harlem River at the northern end of Manhattan Island. The greatest pollution I should say on that day existed at about in the neighborhood of High Bridge and the Harlem River; that is I should say from Washington Bridge down to where the Harlem joins the East River the conditions are bad. They are worse there than anywhere else, than even in the East River. There are two of three large sewers that discharge into the Harlem River from the Bronx within that distance.

Q. Do you know anything about the contemplated purification plant that is about to be established for the Bronx Valley sewer?

A. No, I do not.

Q. That would be north of your jurisdiction anyhow?

A. Yes, sir, that is not within our jurisdiction.

Q. Now do you know of any other facts relative to the pollution of these harbor waters on any of the estuaries or rivers contributing to our harbor waters that you could add that I have not elicited in any way by my questions?

A. No, I do not think I can. My information really is more or less general except in these specific instances where I have
398 had personal observation.

Q. You are a civil engineer, Mr. Schaeffer?

A. Yes, sir.

Q. And you are serving the City of New York officially in that capacity?

A. I am.

Cross-examination by Defendant's Counsel:

Q. Mr. Schaeffer, this scheme for the purification of the Bronx River has been put into operation, hasn't it?

A. Yes, sir.

Q. And it consists of diverting the polluted waters from the Bronx and the East River and discharging them crude into the Hudson River, doesn't it?

A. No.

Q. No?

A. You refer to the Bronx Valley sewer.

Q. I do?

A. As I understand the Bronx Valley sewer it is a sanitary sewer. It is a separate sewer which takes only house drainage. It takes the polluted drainage from buildings but no surface water.

Q. Is not the polluted water from house drainage the most dangerous?

A. Quite true.

Q. And that is being discharged crude into the Hudson River instead of being discharged into the Bronx and through the Bronx into the East River?

A. Yes.

Q. That all has been done?

A. I do not think it has been done. The connections I imagine are under construction now.

Q. Don't you know that it was put into operation last week?

A. Yes, but I do not imagine that all the connections have been made. I think they will be made.

Q. In your examination of the Hudson River in the neighborhood of New York City didn't you find several sewers emptying into the Hudson River?

A. Oh, yes.

Q. How frequently?

A. That I could not tell you without exami-ng the map.

Q. And in the Harlem River it is the same way, isn't it.

399 A. Yes.

Q. In fact the great city of Manhattan has no other means of disposing of its sewage than into the East River, the Hudson River or Harlem River, has it?

A. I think it has not at this time.

Q. Did you ever ascertain how much sewage is discharged every 24 hours by the City of New York into the Hudson River?

A. No.

Q. Have no idea?

A. No, haven't any idea.

Q. Did your investigation go so far as to enable you to ascertain at what depth this Bronx Valley sewer empties into the Hudson?

A. No.

Q. Don't you know anything about that?

A. I know what the plans were, the plans before the construction of the sewer was started. My recollection is that the plans showed that the sewer should discharge about 40 feet below the surface. I understand that the discharge is nearer the surface than that.

Q. Much nearer?

A. Yes, I do not know at what depth but I understand it is nearer the surface.

Q. And exactly where is that discharge on the Hudson?

A. Just a short distance north of the city line, City of New York. The outlet is built through the Watts Institute if that gives any indication to you.

Q. Not to me?

A. I should say it was less than a thousand feet north of the city line.

Q. Do you know how large a territory or how large a population that sewer will accommodate?

A. I do not. I can talk from recollection only on that.

Q. Give us your best recollection?

A. My recollection is that it is for two million or two and one-half million population.

400 By Complainants' Counsel:

Q. Mr. Schaeffer, Mr. McCarter asked you if you knew how many

sewers emptied inti the Hudson from Manhattan Island; I ask you do you know how many sewers empty from Weehawken, Hoboken, way up to Piedmont?

A. No, I do not.

Q. Did your investigations take you over on the Jersey side?

A. No, nor more than we practically went out in the middle of the stream and of course both sources were discussed.

Q. Do you know of your own knowledge that there are trunk sewers emptying from these Jersey municipalities into the Hudson?

A. No, I do not.

HERBERT J. KNAPP, called as a witness on behalf of complainants, being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainainants' Counsel:

Q. Where do you reside, doctor?

A. 287 South Fifth Street, Brooklyn.

Q. Are you a physician?

A. I am.

Q. Are you in active practice?

A. I am.

Q. Have you had occasion at any time to treat troubles of the eye like conjunctivitis?

A. I have.

Q. Have you had any cases that you have undertaken to trace their source?

A. I have.

Q. Will you just describe to the commissioner any experience you have had on that line?

A. On or about two or three years ago I having been connected with the dispensary for the past twenty-five years had noticed for several years boys come into the dispensary for treatment of the eyes, which was my sole clinic at that time, having been in bathing around about the foot of North Second Street in Brooklyn. There
401 was a bath located near the sewer. Invariably I would say you have been in swimming today or yesterday and they would say yes. They were little—what you might call dock rats—and I was very much interested to get an answer to that question, and invaribly they would have a purulent form of conjunctivitis. That is, conjunctivitis is simply an inflammation of the lids, first starting with a redness and then a catarrahal condition with great pain and swelling of the eyelids, with the matter of course. I use the words catarrahal condition as matter is coming from it. That goes on sometimes to inflammation of the cornea, what is called the window of the eye, the pupil, and sometimes it leads to blindness. It is a highly infectious disease and is generally brought on by direct contact or through contact from some pollution. It has been known to be found in barracks, that is in army barracks or hospitals.

Q. And those cases you traced to infection from sewage polluted bathing water?

A. That is what I attributed it to.

Q. In any of your clinics did you have infections of the eye that you traced to the same source at any time?

A. Well, I did not, I don't remember of any.

Q. But the infection from such polluted water if it will produce conjunctivitis will affect the mucus membrane anywhere it comes in contact with the catarrahal condition that you have described?

A. Any irritation that is produced by a foreign substance will produce this purulent conjunctivitis.

Cross-examination by Defendants' Counsel:

Q. Is it your view, doctor, that it is necessary to have bathed in polluted water in order to suffer from conjunctivitis?

A. No, sir.

Q. What other causes will produce it?

A. I have stated that possibly uncleanliness of any kind will produce conjunctivitis. I spoke of the crowding of barracks. The history of conjunctivitis is quite nice to read. It tells the story that out of 14,000 Prussians there were 1,100 who were taken down
402 with conjunctivitis owing to the uncleanliness of the barracks.

Q. Is there any other cause for conjunctivitis than uncleanliness?

A. Yes, sir. There is also the syph-litic condition.

Q. Any other?

A. Yes, sir.

Q. Now give us some others?

A. A scrofula or tubercular condition will produce it.

Q. Well, have you determined or found a specific germ for this disease?

A. Well, I don't think so.

Q. And if the tendency exists from any one of those other causes that you have mentioned, syph-litic, tubercular or scrofulas, would the indulging in sea water bathing and the chill that might result from it be likely to produce this disease?

A. I don't think so.

By Commplainants' Counsel:

Q. In conjunctivitis, doctor, the discharge from the inflamed lids and the conjunctiva of the mucus membrane is that of pus, isn't it?

A. Yes.

Q. If mucus is rapidly made it looks turgid and resembles pus, doesn't it, so that while the staphylococus may not be present it would look like laudable pus?

A. Yes.

Q. Am I using proper medical terms, doctor?

A. I think you did very nicely.

Q. Finding an eye with the symptoms of conjunctivitis a physican will undertake to trace the source of an infection, will he not?

A. He will.

Q. And in undertaking to trace the sources of the infections that

you had to deal with you usually asked those children if they had been bathing in the waters near a sewer over there is Brooklyn?
A. That's right.
Q. And you found they had usually?
A. That's right.

403 By Defendants' Counsel:

Q. Isn't it a fact that the most common occasion for the onset of this disease is direct contact with some other subject that has it?
A. Yes.

By Complainants' Counsel:

Q. Doctor, did you ever meet me until you met me in this room here just before you gave your testimony in this room?
A. No, sir, I never knew you, I don't know who you are now.

Defendants' Counsel: Who did ask you to come here?
The Witness: A voice on the telephone.

HERMAN W. MERKEL, called as a witness on behalf of complainants being first duly sworn by the commissioner testifies as follows:

Direct examination by Complainants' Counsel:

Q. Where do you reside, Mr. Merkel?
A. Boston Road, Bronxdale.
Q. Are you connected with any of the public enterprises of the great municipality of New York?
A. I am connected with the New York Zoological Park.
Q. In what capacity?
A. My official title is Chief Forrester and Constructor. In other words I have most of the work to do.
Q. In the course of your official duties, Mr. Merkel, have you had occasion to inform yourself of the condition of the Bronx River and its relation to any matters under your jurisdiction?
A. I have.
Q. Now will you state as fully as you may on that point?
A. I have had the Bronx River under observation for the last thirteen years. For the last ten years I have lived practically on the banks of it. That is to say within 400 feet of the shore
404 of the river. I pass the river five or six times every day. I have often had to go upon it in boats. I have once or twice dived into it and built a dam across the Bronx River, so I think it may be said I am fairly familiar with the condition of the Bronx River. In that time, during which the Bronx River has been under my observation it has become more and more polluted. I think the increase in population has been greater in the last five years than previous to that. Not only does the pollution consist of sewage which enters the river all the way from where it enters the East River up almost to Kensico Dam but it consists very largely of superficial pollution such as is caused by dead animals and surface drainage from the streets. The streets in Williamsbridge and

Mount Vernon, even further up, run across the Bronx River and of course the surface drainage from all these streets carrying with them horse manure and other street dirt enters the Bronx River, and of course the Bronx Valley sewer does not take care of that, can never take care of that. Regarding the dead animals, I want to say that only this spring we pulled out—I won't be sure of the exact number—but it was over ten dead dogs and a great many more dead cats and chickens. In most cases we bury them. Of course a great many get by us and get into the East River. The recent pollution appears worse within the limits of the Zoological Park than above it and this is because the river widens out at this point into two lakes called Bronx Lake and Lake Aggaziz, both of the lakes being largely artificial, and of course the sediment is discharged there, so that about four years ago I had to remove about 22,000 yards of sediment out of Lake Aggaziz because it was becoming too shallow. We have now a project in view to clean Bronx Lake, which is below Lake Aggaziz.

405 Q. When you say sediment do you mean this sludge that is deposited from sewage?

A. Sludge and also a certain amount of soil that is washed down by the Spring floods. The matter which we removed was also in layers. There was one layer of silt which was brought down in the Spring. Before that would be a layer of putrifying animal and vegetable matter and a great many leaves, because the lower part of the Bronx is forrested to a certain extent, or otherwise, and if I remember correctly within three feet I found seven animal layers of deposited matter. I think those figures are correct but of course I came here without preparation.

Q. Are you familiar with the conditions in any part of our harbor waters?

A. Why, to a certain extent, I have motor boated through the harbor, and I do know that the Aquarium people, which is under the same control as the New York Zoological Park, were not able to keep alive for any length of time invertebrate marine life on account of the polluted water which they were pumping from the Bay. I know we have now established a system of stored sea water such as is used in most first class acquariums, which is cleansed and circulated continually and used over again.

Q. Have you given any special study to marine life?

A. No, not any more than I have given to any other life.

Q. You use the terminology so facile I thought you had?

A. I am sure I didn't notice it if I did.

Q. Mr. Merkel, can the Bronx Valley sewer in any way remedy the conditions you have described in the Bronx River?

A. To a very large extent, not entirely, because the surface pollution cannot be taken care of by the sewers, of course, but that will largely be taken care of by the new project of the Bronx Valley Parkway.

Q. Does it interfere with the well-being of the park?

A. Oh, yes, undoubtedly.

406 Q. Just state in what way?

A. It is a great source of malaria, always has been.

Q. This sewage pollution?

A. The sewage pollution. Mosquitoes breed quite readily in the Bronx River and of course malarial infection takes place. The well water smells bad and tastes bad. Very often it is dark, especially when the natural rainfall is slight, and most of it is sewage.

Q. Have you made a special study of the subject of forestry?

A. I have.

Q. Taken any diplomas or certificates?

A. No.

Q. From your observation in the harbor waters from motor boats have you noticed the polluted condition of the harbor waters?

A. Yes.

Q. Is it extensive?

A. It is universal, I should say.

Q. Do you think it would improve it any to have three hundred and sixty million gallons of sewage a day added?

A. It would certainly make it a great deal worse.

Cross-examination by Defendants' Counsel:

Q. Mr. Merkel, do you know what the flow of the Bronx River is, the average flow?

A. I have known but don't recollect.

Q. Do you know what the discharge of sewage, either sewage properly so called or street washings into the Bronx River is?

A. I do not.

Q. You therefore do not know the percentage of pollution that goes into the Bronx River?

A. No, I do not. I have known both of these things but it was years ago and I then only knew by reading reports, not by actual measurement.

Q. Have you made any special study of the breeding of mosquitos?

A. Not any special study. I know their life history and know their habits.

Q. You don't know whether they are bred extensively out
407 of waters polluted with organic, I mean by that animal matter or vegetable pollution?

A. I do know they breed more readily in polluted than in fresh water.

Q. And is the water polluted with organic animal matter more prolific or vegetable polluted water?

A. I should say the water polluted with animal matter.

Q. You should say that?

A. But I don't know that of my own knowledge.

Q. Do you know where the Aquarium pumped the water supply for its tanks before they adopted the scheme of going out to sea for it?

A. I never saw the pipe but I have been told by the director and the engineers down there that it was just outside of the Battery.

Q. Just along the shore line?

A. Within a few hundred feet of the shore.

Q. And this invertebrate marine life that you testified to, is that a hardy variety of life or not?

A. No, it is never as far as my understanding of it goes, it is never found near shores where the water is polluted, but only in comparatively pure water.

Q. Is there difficulty to preserve it in existence as a living organism?

A. In polluted water?

Q. In any kind of water?

A. No.

Redirect examination by Complainants' Counsel:

Q. Do you wish to add to that?

A. I mean to say that in fresh sea water it is not difficult to keep marine vertebrate life in captivity or in specimen cases. I have seen them in inland aquariums as far as, for instance, as the City of Berlin, kept in stored sea water without difficulty, sea water that had to be brought in tank cars way across.

Q. And as a matter of your own observation you do know, and I understand you to so testify, that mosquitos breed faster
408 in water that has organic matter and is stagnant?

A. I would not say as a matter of personal observation. I know that polluted water seems to be more frequented by mosquitos, probably on account of the fact that it is more stagnant, does not flow as rapidly and carry the eggs away. I know that mosquitos will lay their eggs in stagnant water and polluted water quicker than they will in absolutely fresh water.

Q. Mr. Merkel, did you ever see me or speak to me before you came into this room here?

A. I did not.

Recross-examination by Defendants' Counsel:

Q. Have you ever made special study of mosquitos?

A. I don't know what you mean by special study. As I said before I know the life history of mosquitos. I have seen them hatched and I have seen them lay eggs. I know the malarial breeding variety from the other one. The anopheles from the—you will have to help me out there doctor?

Complainants' Counsel: Stagomesic?

The Witness: Exactly.

Q. Do you know whether they are, both varities, malarial carrying?

A. I understand that only the anopheles is the carrying one.

Adjourned to June 28th, at 10:28 A. M.

409 Supreme Court of the United States, October Term, 1910.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

229 BROADWAY, NEW YORK CITY, June 28th, 1911.

Before James D. Maher, Esq., Commissioner.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York.
William A. McQuaid, esq., Deputy Attorney General and
Dr. William J. O'Sullivan, Special Counsel for The People of the State of New York, Complainants.
Edmund Wilson, esq., Attorney General of the State of New Jersey,
Robert H. McCarter, esq., of Counsel for the State of New Jersey,
Joseph Coult, esq., and Adrian Riker, esq., of Counsel for Passaic Valley Sewerage Commission, Defendants.

DR. GEORGE W. BRUSH, called as a witness on behalf of Complainants, being first duly sworn, by the Commissioner, testified as follows:

Direct examination by Complainants' Counsel:

Q. Where do you reside, doctor?
A. 462 Ocean Avenue, Brooklyn, New York.
Q. How long have you been a resident of the City of New York?
A. Over fifty years—resident of the City?
Q. Yes?
A. I have been a resident of Brooklyn over fifty years and the City of New York since its consolidation.
410 Q. Where did you graduate?
A. Long Island College Hospital.
Q. In what year?
A. 1876.
Q. Have you been an active practitioner during any part of that time?
A. Yes, sir, all of that time up to five years ago when I retired from practice.
Q. Have you given any special attention to infectious diseases like Tuberculosis?
A. Yes, sir.
A. To what extent did you investigate or study these infectious diseases?
A. Shall I answer that in full?

Q. Yes, sir?

A. It became my duty in 1898 as chairman of the Senate Committee of Public Health and Chairman of a special committee appointed for that purpose to take up the question of the feasibility and advisibility of establishing a hospital, state hospital for the treatment of incipient cases of tuberculosis and I spent several months after the adjournment of the Legislature in studying that question, looking up authorities, visiting various sanitaria, and wrote the report comprising some 125 pages of the publications of the Legislature, and also had prepared a Bill which was introduced and finally passed and the hospital is now established at Raybrook in the Adirondacks and under operation.

Q. Have you given any special thought to the study of pollution, doctor?

A. Some, in connection with this very matter now under investigation.

Q. Are you connected with any of the civic bodies of Brooklyn?

A. Yes, sir, I have been President of the Brooklyn League for the last three years, that is a civic body composed of the business and professional men of the city, non-partisan in its purposes, and its object is to co-operate with our city authorities in en-
411 deavoring to better conditions wherever we find them needed, and is composed of about 1400 of what we term our best citizens.

Q. And the object of that Brooklyn League, that civic body, is what?

A. Its object is to study civic questions and co-operate with the city authorities for bettering conditions wherever we find we can do it.

Q. You were connected with that League in 1908, doctor?

A. Yes, sir, that league was organized in 1907, I think, and my impression is that I was a member of it then.

Q. Did you represent the Brooklyn League at the hearings before the Harbor Line Board in protest against the granting of a permit to the Pacific Valley Sewerage Commission of New Jersey?

A. Yes, sir. I beg your pardon. In answering your question you said 1908. I thought you said 1890. You will have to strike out that answer because the League was organized in 1897, I think it was, and I have been President of it the last three years, that is 1908, 1909 and 1910.

Q. Before appearing before the Harbor Line Board and testifying as a representative of the Brooklyn League had you given any special thought or investigation to the subject matter of pollution?

A. Yes, sir, I had studied that matter to some extent and had read very carefully an ably prepared report of the Committee of the Merchants' Association on that subject.

Q. What report do you refer to, describe it?

A. Their report on the question of the pollution of the waters of New York Harbor as prepared, I think it was two or three years ago, I am not sure of the exact time.

Q. In your investigations of this subject of pollution in regard to our harbor waters what would you say relative to floating sewage, flies and disease?

412 A. I should say it was a menace to health, if we have that sewage to the extent that it exists in our waters at the present time.

Q. Is Typhoid an endemic disease in New York City?

A. Yes, sir.

Q. What does a physician mean when he employs the term endemic, doctor.

A. Cases here and there. Epidemic may be more general.

Q. And endemic means that it is always there at some point, does it not?

A. Yes, sir.

Q. So that we have Typhoid always with us in this city to some extent?

A. Yes, sir.

Q. Have you investigated how and where the various hospitals discharge their refuse waste into the harbor waters?

A. No, sir, I have not gone into that particularly.

Q. How do periods of flood affect the distribution or increase in intestinal diseases?

A. Apt to increase because the water rises and then subsides and leaves the debris of floating material upon the banks or upon ports or docks.

Q. Do you know whether or not they have traced infection, typhoid infection, to the handling of drift wood in our harbor waters?

A. I don't know specifically of any cases but I should imagine it might be done because the method of infection is to carry the germ of the disease into the intestinal canal and handling a piece of drift wood with that bacteria or germ upon it and then carrying it to the mouth, wiping the lips even would be sufficient to cause the infection, provided the system was in a condition to become infected. It is perfectly possible for a person to swallow thousands of germs of Typhoid Fever and not become infected with it because the system may be in a condition to receive it.

Q. This organic matter discharged as sewage does that float or sink in our harbor waters?

A. Well, it is apt to float, perhaps not on the surface but 413 immediately under and some of it on the surface,

Q. And in that way it leaves the deposits you describe on walls and piers and on this drift wood?

A. Yes, sir.

Q. Do you know as a physician whether flies alighting on these posts and on this drift wood transmit infectious diseases?

A. Yes, sir.

Q. You do know that as a fact?

A. Flies may light upon this and carry germs upon their feet. Those same flies if there are articles of food exposed for sale in the immediate vicinity they will communicate these germs to the

articles of food and of course there is danger of those articles if sold becoming a menace to the community.

Q. Under the present temperatures of our waters during the summer months and with the large amount of organic matter in our harbor waters will this bacilli survive after discharging to other waters for any length of time?

A. They are apt to survive for a given length of time. Of course you cannot fix exactly the limit. Long enough anyway to be a source of danger.

Q. Will flies alighting on this polluted sewage transmit infectious diseases by afterwards alighting on food products?

A. Yes, sir, I think I stated that.

Q. What would you say as to the condition of our harbor waters at present, as to their degree or condition of pollution?

A. If the facts are true as they seem to be from the reports that have been made, the investigations that have been carried out, they are a disgrace to our civilization.

Q. On what did you base your protest at the Harbor Line Board, on what grounds did you base your protest to the building, construction and operation of the Passaic Valley Trunk Sewer?

Defendants' Counsel: Did he make a protest in writing?

414 Complainants' Counsel: He made it orally in testimony given under oath, Judge.

A. On the ground that the additional sewage which would be carried into the harbor would make a condition of things already bad beyond what we ought to submit to still worse.

Q. Was the protest made on behalf of that Brooklyn League on humanitarian or on selfish grounds?

A. Wholly on humanitarian grounds.

Q. And dealt with the health and well-being of the people?

A. Yes, sir.

Q. Can you see or smell or comprehend these enemies of humanity known as bacteria?

A. Sometimes you can and sometimes you cannot. Some of our worst enemies in the form of bacteria are without odor and it is impossible to detect their presence.

Q. Were you active in efforts to secure legislation at Albany to prevent further emptying of sewage into our harbor waters?

A. Not specially that form, but I did take interest in the question of the pollution of our streams in the state by surface drainage draining into the streams and rivers of the state and introduced a measure to investigate that subject with a view of preventing it in the future.

Q. Did you make any efforts on behalf of the Brooklyn League and from your studies of pollution to secure the installation of disposal plants, sewage disposal plants?

A. No, sir, I think I had recommended it a number of times but no special efforts have been made.

Q. Is there any special point that you wanted to now testify on

relative to the pollution of our harbor waters that I have not brought out by any question of mine?

A. Do you wish me to give my opinion or what I think ought to be done?

Q. Yes, sir, we would be glad to have them.

Defendants' Counsel: We think there ought to be some
415 question. I do not think the doctor ought to be allowed to run riot on a question without any inquiry to which we could object or anything of that kind.

A. Well, it seems to me as a public spirited citizen and one interested in the welfare of the citizens of this city, that, with the revelations which science *have* given us, and the methods that we have of caring for the public health, destroying the dangerous elements in sewage and carrying it even to the disposal of dead bodies, that we ought not to submit to any system which would add to the dangers, and we ought, on the contrary, to adopt some method by which the danger to the living should be lessened in every possible way that science will allow us to bring it about.

Q. How long have you been interested in this subject matter of pollution, doctor?

A. More or less during my whole professional life but more especially within the last two or three years.

Q. But your earlier efforts——

A. There were no special efforts earlier in my career.

Q. Have you had any direct experience as a physician in which you have traced infection to either bathing or performing other functions in these polluted harbor waters?

A. No special experience.

Cross-examination by Defendants' Counsel:

Q. Doctor, as I understand, you appeared before the Military Board and protested against the proposition that the defendants have?

A. I did.

Q. Your efforts were not successful, were they?

A. Partially so, I think.

Q. Well, at any rate you are aware that the project represented by the defendants has the sanction of the War Department
416 now, are you not?

A. Has what?

Q. Has the sanction of the War Department?

A. I knew that there had been a decision of the matter but I did not know that it was final.

Q. Did you know that the Government through its Secretary of War and the Engineering force had given their express approval to the project sought to be enjoined by this suit and had withdrawn from the suit?

A. No, I did not.

Q. You did not know that.

A. No.

Q. Your curiosity and interest—the interest that you had had not gone to the extent of finding out what the result was of this protest?

A. Well, I have been interested in other matters and have been away and part of the year abroad and I have not had that brought to my attention.

Q. You are aware, of course, that New Jersey is on the other side of the Hudson River.

A. Yes.

Q. Your idea is that New York should have a monopoly of polluting or pouring sewage into the Hudson River?

A. Excuse me, I think New York should mend her ways and not pour sewage into the river.

Q. Is it your idea that the pouring of sewage into a great harbor such as New York is entirely out of date?

A. Yes, sir, I think it ought to be abolished as soon as possible.

Q. Do you know that it is being done with great success in several very large cities?

A. I don't know how successfully. I think there is always an element of danger in it.

Q. Do you know anything about Boston?

A. In a general way.

Q. You know they do it there, don't you?

A. Yes.

Q. Under very able engineering advice?

A. Possibly.

Q. After a very thorough discussion and investigation
417 and also abroad through several cities, don't you know that?

A. Yes, but that is not conclusive, sir.

Q. So that you don't pretend to say that your own view that sewage should never be poured into a harbor is the universal view, do you?

A. I don't pretend that you might not pour a certain percentage of sewage into the harbor and that it might not be a serious menace, but I do say that you may reach a point where the waters of that harbor will be a source of danger to the citizens by overloading it with sewage.

Q. Don't authorities differ upon that too?

A. Very likely.

Q. Isn't it a great question among physicians of the highest character whether or not unless you actually drink and injure your intestines by this polluted matter the public health is not affected to the slightest degree?

A. That can only be determined by investigations such as that which has been made by the Merchants Association and others and trace the cause and the results. It has been almost impossible to convince the average citizen that these germs of Typhoid, for instance, and Tuberculosis, are a source of danger, and there are thousands of people today who think it is a fad that often a physician has if he advocates it under such circumstances.

Q. What is the cause or connection, if any, between pollution or sewage and Tuberculosis?

A. As I stated in my testimony a little while ago you might take a swallow of water loaded with the germs—now if you take this instance—here is a man that is suffering from Tuberculosis. He expectorates, we will say, in a stream. There is a person bathing in that stream and they take a little water in their mouth and we will suppose—rather an unusual case—that that water is loaded with the germs and swallowed. Now if the system of that person
418 is in a receptive condition they contract Tuberculosis.

Q. Then you are premising the fact that the spit*tal* of a consumptive will go into the water originally, aren't you?

A. Yes, sir. Let me give you an incident, if I may, if I do not digress too much. There was a very talented young man, a city editor of one of our papers that went down to Coney Island not more than a little over a year ago, and I think his child fell into the water; at any rate he jumped in after this child and he had some difficulty in getting out and swallowed some of the water. Within two or three weeks that young man developed Typhoid Fever and died.

Q. We are speaking now of Tuberculosis?

A. I know, but the general subject of infectious diseases, Tuberculosis and Typhoid, we can put in the same class.

Q. What is the death rate in Manhattan?

A. You mean the death rate of the whole city for all diseases?

Q. Yes?

A. I don't believe I can give you that.

Q. It is not abnormally high, is it?

A. No, sir.

Q. Is there an unusual amount of Typhoid or other endemic diseases?

A. I don't think so.

Q. As matter of fact, however, the whole sewage of the five million people in the City of Manhattan pours into your waters right here, don't it?

A. Yes, sir.

Q. And pours in right on the shores too?

A. Yes, but where we have these infectious diseases the efforts should be to abolish them. We are suffering constantly from diseases that are the results of carelessness and of lack of provision against the effect of these germs.

Q. Do you think that New York suffers in that manner any more than any other city of large size and poor population in *in* certain quarters?

A. No, I can't say that I think it does.

Q. In other words you would like to see as we all would
419 like to see an improvement in our health?

A. Yes, sir.

Q. I do not believe you and I have any zeal to be an angel that the hymn talks about?

A. No this is a pretty good place to be. What I want to say in a general way, if you will excuse me, is that humanity generally, taking it right through, this country and others, we are suffering

from these infectious diseases which by proper care could be avoided, whether Typhoid or Tuberculosis or what not, might just as well be practically abolished.

Q. Abolish every disease but old age?

A. Well, old age we have all got to come to but we must not acknowledge it.

Q. Doctor, do you know what the percentage of sewage or pollution saturation sea water will stand without being dangerous?

A. I do not. I do not pretend to be an expert on these matters.

Q. Do you know what the percentage of pollution of the New York harbor waters taken as a whole is at the present time?

A. No, I couldn't give you that. If I have read it in this report I have forgotten it since.

Q. Do you know the amount of water that is in the harbor of New York, actual quantity?

A. No, sir.

Q. Do you know the flow of the Hudson River through New York Harbor?

A. No, sir.

Complainants' Counsel: Make that question specific. Does he know what the flow of the Hudson River is in 24 hours; what the quantity of flow through the harbor is?

A. The water flows in and flows out again.

Q. The water of the Hudson River flows in and flows out again?

A. Mingles with the waters of the harbor and then flows back with the tide.

Q. Do you know what the actual effect would be of the discharge at Robbins Reef at the proposed depth the Passaic Valley
420 Sewerage Commissioner sewer will discharge, of the total amount of attempted discharge, upon the body of the water at New York Bay?

A. No, sir.

Redirect examination by Complainants' Counsel:

Q. Doctor, Mr. McCarter asked you about the relationship between Tuberculosis and sewage; have we an hospital here especially for the treatment of Tuberculosis that discharges its sewage into the East River.

A. I don't know of any hospital in this city. There is a private hospital in Brooklyn. We haven't any special hospital in the city. The hospitals as a rule try to get rid of those cases if they can. They don't take them if they can avoid it. Some of them I believe have wards for such built for their treatment. In the Kings County Hospital they have a special building where they take these cases.

Q. But the sewage of other hospitals all goes into these harbor waters?

A. Yes, sir.

Q. Mr. McCarter asked you about the Boston scheme of dis-

charging on outgoing tides; do you know whether or not that is a failure or success?

A. No, I do not.

Q. Do you know whether or not two commissions, one appointed by the State Government and the other appointed by the Mayor of the city have been working on these problems of our harbor pollution for nearly eight years?

A. I have been so told.

Q. Mr. McCarter asked you about the War Department approving of the scheme of the Passaic Valley Sewage Commission; did you understand at the time you appeared before the Harbor Line Board that the only question before that Board was as to the issuance of a permit to go under New York Bay and as to whether or not it would interfere with navigation of the Upper Bay?

A. I didn't know that it was as to a question of navigation. I understood it was as to the question of the issuance of a per-
421 mit for this purpose.

Q. To tunnel under the two bays?

A. Yes, sir.

Q. And that was all that the Harbor Line Board had under consideration?

A. I don't know that as a fact.

Q. Did you know whether or not plans were submitted for this tunnelling for which a permit was sought?

A. I didn't know about plans. I did know that that was the reason I went—because I understood there had been an application made for the construction of a tunnel which would empty this sewage into the harbor.

Q. And that was the question that was before the Harbor Line Board?

Defendants' Counsel: We object to that; the papers will show.
The Commissioner: Note the objection.

A. I so understood it.

By Defendants' Counsel:

Q. In that case of Typhoid Fever that you referred to how do you know that that was caused by the taking in of the water at Coney Island?

A. I don't know. That is purely an assumption. That was the only thing that they could trace it to.

Q. So far as the history of the case disclosed what the patient had been doing within a limited period that was the only thing the doctors could ascribe it to?

A. Yes, sir.

Q. Do you know of your own knowledge whether he had eaten of lettuce or celery or any of those vegetables, green vegetables that may have been contaminated with Typhoid germs?

A. No, sir, I do not. I only know that he was a strong, vigorous man up to that time.

Q. And got Typhoid?

A. Yes, sir.

By Complainants' Counsel:

Q. When was the first time you ever met me in your life?

422 A. This morning about an hour ago I should judge. I met you at half past nine in the office, the first time I ever saw you.

By Defendants' Counsel:

Q. Who invited you to come to this hearing?

A. I was invited to come here by the Doctor in view of my testimony, which he had read, before the Harbor Committee.

O. HARRY SMITH, called as a witness on behalf of the Complainants being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. Are you connected with any of the large enterprises of this city, Mr. Smith?

A. I am sir.

Q. What one, sir?

A. New York Dock Company.

Q. What is their special province, just describe it?

A. The Dock Company owns something like two miles and a fraction of water front on the Brooklyn side of the East River extending from Main Street to Red Hook Point on which there are about 37 piers, some 250 warehouses and about seven miles of railroad track. The business is the leasing of the piers to regular liners and tramp steamships and warehousing.

Q. Is the New York Dock Company interested in harbor conditions?

A. Yes, sir.

Q. Have they taken any active part to preserve the usefulness and the cleanliness of our harbor waters in any way?

A. We have been protesting against the flushing of the Gowanus Canal into the waters of the East River at the foot of Degraw Street.

Q. And the object of your protest was what?

A. Was to prevent the further pollution of the waters adjoining our property.

Q. And what do you mean by the flushing of the Gowanus Canal?

A. Well, briefly, a tunnel runs from the head of the

423 Gowanus Canal under the Borough of Brooklyn to the East River at the foot of Degraw Street. They are pumping the waters of the canal through the tunnel into the waters of the East River.

Q. Who are doing that?

A. Borough of Brooklyn.

Q. The City of New York?

A. Yes, sir.

Q. And doing it with what object?

A. To purify the waters of the Gowanus Canal.

Q. By displacing them and putting them into the main channel?

A. Yes, sir.

Q. And you object, or rather the New York Dock Company objects to the pollution of the channel on that account, is that it?

A. Yes, sir.

Q. Does the New York Dock Company take any particular interest in harbor conditions?

A. Yes, because the condition of the waters affect our business more or less.

Q. In a general way state how it affects the hulls of vessels and subject matter of transportation and the like?

A. I am not expert enough on——

Q. I mean in a general way.

A. I am not an expert of conditions of hulls of vessels for the length of time they stay at our piers to state, but we do know that there are a lot of sewers emptying at our property which deposits considerable sewage matter in the course of the year.

Q. And that affects the hulls of vessels, the paint and the metals, does it?

A. I cannot say as to that of my own knowledge.

Q. Do you think it would improve conditions to discharge approximately 360 million gallons of crude sewage a day in the main channel?

Defendants' Counsel: We object. He is incompetent to pass on that.

Complainants' Counsel: I withdraw the question.

424 Q. Do you think it would improve the harbor conditions to add a large volume of crude sewage to their present polluted condition?

Defendants' Counsel: Same objection.

The Commissioner: Note the objection.

Complainants' Counsel: I press the question?

A. I cannot say that it would improve them.

Q. What would it be likely to do?

A. It would be likely to further pollute them.

Q. And your New York Dock Company is protesting in the courts against the present pollution of Buttermilk Channel?

A. We have not reached the courts.

Q. Have you taken no legal action.

A. Except communications with the President of the Borough of Brooklyn.

Q. Seeking to restrain them from flushing out the Gowanus Canal?

A. Seeking to induce them to stop that.

Q. Is there anything you wish to add in relation to harbor pollution, Mr. Smith?

A. Well, we have had engineers, sanitary engineers, examine the condition of our waters with especial reference to the deposits from the sewers of the borough emptying on our property and I have found there is a considerable deposit there from this source which necessitates a great deal of dredging and a considerable amount of

money and outlays of this sort and there is more or less odor of an offensive character.

Q. You are speaking now about docks and piers?

A. The slips between the piers.

Cross-examination by Defendants' Counsel:

Q. What position do you hold in this New York Dock Company, Mr. Smith?

A. An assistant secretary.

Q. Is that a corporation?

A. Yes, sir.

Q. And they own this vast tract of land in Brooklyn?

425 A. Yes, sir.

Q. Won't you give its location with regard to Manhattan?

A. Well, it is opposite the lower end of Manhattan Island extending to a point opposite Governors Island and the extreme end of Governors Island.

Q. Where is it with respect to the Bush Terminal?

A. North and westerly of the Bush Terminal.

Q. Now, as I understand it a great deal of pollution comes right from the City of Brooklyn into the waters of the East River at your very piers; how many sewers so empty?

A. There are about twenty.

Q. Were they there when you started your enterprise?

A. I couldn't say as to that. The property is 50, or 60 years older than that.

Q. This Gowanus Canal, perhaps the Honorable Supreme Court does not know as much about it as we do, what is that?

A. It is a canal the lower end of which is at Gowanus Bay and the upper end—I don't know the exact length but it ends not a great distance, not very many miles.

Q. Running into Brooklyn?

A. Yes, sir.

Q. It is an open sewer, isn't it?

A. So called.

Q. And this flushing that you speak of is an effort on the part of the City of Brooklyn by flushing to pour into the East River the sewage that collects in this open sewer called Gowanus Canal, is that right?

A. Yes.

Q. How long has Brooklyn been doing that?

A. The operation started within the last month, within the month of June, I don't know the exact date.

Q. And how often do they flush the canal?

A. I can't tell as to that either. I think they operate the pumps several hours, perhaps always. Some days they operate them all day.

Q. And your company has been protesting to the Borough

426 President against that act?

A. Yes.

Q. Because you think inasmuch as that empties near your property it injures your property, is that the idea?

A. Yes, sir.

Q. Do you know what the project is on the part of the horrible State of New Jersey that is sought to be stopped by this litigation?

A. My general knowledge is that they propose to empty the sewage from the Passaic Valley into the waters of New York Harbor.

Q. Do you know where?

A. I am told at Robbins Reef.

Q. Do you know how far that is from your property?

A. I never measured it.

Q. Well about how far?

A. I couldn't say exactly.

Q. Do you know the condition and limitation upon which that discharge is to be effected and made?

A. I do not.

Q. Haven't read that?

A. No.

Q. Are you aware that the project is under bond or agreement with the United States Government that the result of the work will not be to add to the pollution of the harbor?

A. No.

Q. Had not heard of that?

A. No, sir.

Q. Where has the sewage that has heretofore been in the canal, the Gowanus Canal, discharged?

A. Through Gowanus Bay.

Q. Same place that it is discharged now?

A. No not exactly. There is a distance of a mile, more or less.

Q. The present point of discharge is nearer your property than it was?

A. Yes, touches right on our property.

JOHN QUINCY ADAMS, called as a witness on behalf of complainants, being first duly sworn by the Commissioner, testifies as follows:

427 Direct examination by Complainants' Counsel:

Q. Mr. Adams, are you connected with any of the Municipal departments or boroughs?

A. Yes, sir, I am connected with the Art Commission of the City of New York.

Q. What are these special functions of the Art Commission?

A. Its jurisdiction is to pass upon all designs of public structures going upon public land, to pass upon the layouts for driveways and parks, pass upon works of art that are brought to the city or bought by the city, that is in a general way.

Q. Do the functions of your department deal with the appearance of bridges?

A. Yes, sir, we have to pass upon the designs of bridges, ferry houses.

Q. And other structures along the water front?

A. Yes, sir, even though they are put up by private companies we have to pass upon the designs for them if they go on land belonging to the city.

Q. And the object of all that is what?

A. To make the City of New York more attractive, give it greater aesthetic value.

Q. And with the ultimate object?

A. Of making it a more wholesome and better place to live. Making better citizens.

Q. You believe in the economic value of beauty?

A. Yes, sir.

Q. And, all the energies and objective functions of your commission are to make this city a more healthy place to live and a more beautiful place to transact business in?

A. Yes, sir.

Q. And both you think will react on the citizenship and improve it?

A. Yes, sir, we know that.

Q. Are you a commissioner?

A. No, sir, I am only the executive officer. I am employed by the city. The commissioners receive no salary and give their time to the city free.

428 Q. In the course of your executive duties, Mr. Adams, have you had occasion to observe the conditions of our harbor waters?

A. Only in a general way. Of course I cross the Bay twice a day. I live in Staten Island and in that way I have had occasion to observe the waters in a general way.

Q. Do you pass anywhere near Robbins Reef each day?

A. Very close, within a few hundred feet I think our ferry-boats pass.

Q. And that is near the main channel, isn't it?

A. Yes, sir.

Q. Have you observed the condition of the harbor waters?

A. No, I have not especially, only occasionally. The water of course seems somewhat unpleasant to look at.

Q. What part of Staten Island do you live on?

A. I live just below St. George Ferry Terminal, on what is called Ft. Hill, so that my house overlooks the Bay.

Q. Have you had occasion to use the shores at any time of Staten Island for bathing?

A. No, sir, I do not think any one uses the shores.

Q. Why?

A. Well I don't know, but I suppose it is because the water is filthy.

Q. Have you seen any deposits on the shore yourself?

A. No, sir.

Q. You keep away from the shores altogether?

A. Yes, unless I have friends living near them. Sometimes I have to go down near the shore.

Q. Are you familiar with the Kill von Kull?

A. No, sir, I am not.

Q. Do you think it would improve the Harbor to discharge at Robbins Reef a large volume of sewage per day?

A. Certainly not.

Defendants' Counsel: I object to that as immaterial and irrelevant and the witness is incompetent to testify.

429 Q. Would it improve the aesthetic appearance of a harbor to discharge a very large volume of sewage at that point, Robbins Reef?

Defendants' Counsel: Objected to, not within the issues and immaterial.

The Commissioner: Note the objection.

A. Why of course it might—some of that might come to the surface but it seems to me unfortunately it would injure the harbor in that all pollution of that kind is apt to deter boating, sail boats and motor boats and I think a large part of the body of New York Harbor, which we all know is one — the most beautiful in the world—I have seen many of the largest harbors in Europe and I think a large part of the beauty of that harbor, of course, is the sail boats and motor boats that go up and down as well as the large steamers. Now anything that would pollute the water would undoubtedly deter that traffic on the bay and would to that extent undoubtedly injure the appearance of the Bay as a beautiful bay. I do not know whether that answers your question but that is the way it seems to us

Q. I understood you to say a moment ago Mr. Adams that you had visited large European cities?

A. Yes.

Q. Isn't it a fact that cities like Paris and London and other European cities make a special work to improve their waters and their embankments and their other water frontages?

A. Yes, there is no question that all the continental cities have improved, made their water fronts beautiful. England is doing that a little with the Thames and of course New York has started it with our Hudson River drive and the Bay Shore drive along Brooklyn, and Mr. Cromwell, as you know, has now started to build
430 a beautiful drive along the shore of Staten Island going out each way from the ferry, north and south. Now if I may add another question, it seems to me that is a great asset to a city to have its water fronts made attractive as they can be and still continue commerce. The Thames is a very busy commercial river and yet they have built beautiful embankments now almost up to Batter Sea Bridge and the commerce is not in any way interferred with. The Seine we all know does the same thing. New York can do the same, but of course it seems to me that a large part of this aesthetic value depends upon having a beautiful water underneath that or around it. New York, of course, is just awaking to the value of the water fronts.

Q. Paris was the first city to discover the economic value of beauty?
A. Yes.
Q. And making a place attractive?
A. Yes, sir.
Q. And has really derived a large revenue from the investment so put into her drives and water front?
A. Yes, sir, the Seine embankment. There is no question about that.

Cross-examination by Defendants' Counsel:

Q. Where does London pour its sewage?
A. I don't know. When you ask me on expert questions about sewage I don't know.
Q. They do pour it as a matter of fact into the Thames do they not?
A. I suppose a large part of it is poured into the Thames.
Q. Where does Paris pour it sewage?
A. Into the Seine I think.
Q. Have you given enough study to what my friend across the table has called the economic value of beauty to be able to measure it in dollars and cents?
A. No, sir. Well of course we have tried in a way to do
431 that but that is a very difficult thing to do. Every one knows that there are millions of visitors who go to Paris yearly and spend their money because of the beauty of the city. There is no question about that.
Q. What you mean then by economic value of beauty is the fact that if a city is made attractive it will attract people?
A. Yes, sir, that is one of the great factors undoubtedly.
Q. Now there used to be until within a very few years ago, if it isn't there yet, a place on the shores of Staten Island where people used to go and bathe?
A. It isn't there now.
Q. How long ago was that taken away?
A. It has not been there since I have been there.
Q. How long ago is that?
A. I have lived there now about three years and a half.
Q. But that was a little resort where people went?
A. It may have been before my time.
Q. Since you have been there there has been no such place?
A. No, sir.
Q. Midland Beach I refer to?
A. If you mean on the ocean side——
Q. Midland Beach is on the Bay?
A. That is on the south side of the island, on the Lower Bay. There are bathing places there but I was speaking of the Upper Bay.

Redirect examination by Complainants' Counsel:

Q. Where the Passaic River discharges?
A. Where the Passaic River Sewer would probably come in.

Q. And where the Passaic River discharges now?
A. Yes, sir.
Q. There are no bathing houses on that part of the island?
A. No, sir, there are no bathing houses on that part of the island.

Recross-examination by Defendants' Counsel:

Q. Do you know where the wicked Passaic discharges now
432 its sewage?
A. No, sir, I only know where it wants to.
Q. I understand that you are connected with the City Government of New York?
A. Yes, sir.
Q. Having this very commendable, and to me very delightful, object in view that you have in your department have you ever gone to other branches of the city government and protested against what the city itself is doing?
A. No, sir.
Q. You are making a protest against New Jersey alone?
A. No, sir, we do not believe that one department should protest against the other too much. We want to do our work in our way and we want the other departments to do the same. As citizens we can protest but not as a department of the city.
Q. So you come here and protest against New Jersey but you let New York go on, is that right?
A. We realize of course that New York is not doing her whole duty in regard to sewage.
Q. You were asked to come here by the Law Department of the City of New York?
A. Yes, sir.
Q. Has anybody connected with the State of New York approached you on this subject?
A. No, sir.
Q. The Attorney General or anybody in his office?
A. No, sir.
Q. Have you read in the papers of an effort made by the City of New York to get an appropriation to pay the expenses of this litigation?
A. I do not recall that I read it.
Q. You in your daily passages to and from Staten Island come near to the point of discharge or proposed discharge at Robbin. Reef,
A. I suppose so. We only go a few hundred feet from the light house and I suppose the ferry-boats would pass very near it.
Q. Have you paid any particular attention to the condition of the water at that point at the present time?
433 A. No, sir, not with that in view. In a general way I have sometimes looked at the water. I have looked at the water and seen that——
Q. At that point?
A. Not at that point particularly but in the lower part of the bay.

You see we get so many bad things from New Jersey we do not know just which—we get those smells from Bayonne and we may get smells from the sewerage and we do not know how to separate the two.

Q. But as a matter of fact you have come here to testify in regard to the waters of New York Bay and have not even observed the waters at the point of proposed discharge at the present time?

A. I came here to testify that a polluted bay is a bad thing and acts against the improvement of the shores of that bay.

Q. On general principles too you have not taken the trouble to determine the actual condition of the water at the point of proposed discharge?

A. No.

Q. Now do you know Midland Beach on Staten Island?

A. Slightly, I have been there.

Q. Where is it?

A. Well it is probably three or four miles or two or three miles from the Narrows on the Lower Bay about—I don't know—it is on the south side of the island.

Q. Doesn't it get all the wash from the harbor of New York?

A. I do not think so, I do not know enough about currents to know.

Q. Is it used for bathing purposes?

A. It is.

Q. Do you know anything about the test of the purity of waters as based on the amount of free oxygen in them?

A. No, sir.

Q. You do not know what the amount of free oxygen averages in the Thames in London for instance?

A. No, sir, I do not.

Q. And if you did know you would not know what it
434 meant?

Complainants' Counsel: Objected to. This is certainly outside of the line of his testimony. This gentleman makes aesthetic observations and you are treating him with the chemical cross-examination.

Defendants' Counsel: I am trying to find from him, confining my questions intentionally to the condition of the water, whether he knows what the test of purity as applied to the Thames at London shows.

Complainants' Counsel: I object. His test of beauty is measured by the eye, not by the chemist's test.

The Commissioner: Note the objection.

A. I don't know.

Q. Now you testified there is a wholesome effect of aesthetics; in what respect is that wholesome effect apparent?

A. It is quite apparent to any sensible man that if you ride a bicycle over a stumpy and unpleasant country you will not have the same exhilaration and the same feeling of enjoyment and strength as you will if you ride that through a beautiful, parked country,

with shrubbery and trees and grass etc. I think that is quite evident to any one that the difference in those two would react upon a man's *physican* strength.

Q. That is a sort of species of aesthetic Christian Science?

A. Not at all. If you want me to go into this—there have been many tests made as to the influence of color upon a man's strength. It has been clearly demonstrated that the physical strength depends to a great extent upon the color a man has in his eyes, whether he is conscious of it or not.

Q. What has that got to do with the question of the pollution of the waters of New York Harbor in your opinion and how does the aesthetic sense come into play in connection with the pollution, the chemical pollution, of New York Harbor?

435 A. Well, it seems to me that if you want to have beautiful shores, driveways along the shores, and as I have said before the sail boats and motor boats, the pollution of the Bay of New York is going to act against that sort of enjoyment of the waters.

Q. You are now confining your opinion to the hypothesis of the surface of the water showing pollution, aren't you?

A. Not entirely, because as we all know, we read the papers and know whether the bay is polluted underneath or not.

Q. Assuming that the result of the discharge of a sewer system is free from any surface manifestation of any kind, either to the eye or to the smell, does your theory have any application, in your opinion?

Complainants' Counsel: Objected to, this states in distinct terms an impossibility.

The Commissioner: Note the objection.

Q. Will you answer the question?

A. Please repeat it?

Q. "Assuming that the result of the discharge of a sewer system is free from any surface manifestations of any kind, either to the eye or to the smell, does your theory have any application, in your opinion."?

Complainants' Counsel: Objected to on the further ground that this assumes that there would be no such cause or excuse or characteristic manifestations or offensive look and the offensive odors, and it is well recognized that sewage invariably floats for a time. The question imports an impossible condition for the witness to answer.

The Commissioner: Note the objection.

A. It seems to me that there isn't any question that if we know that a large amount of sewage, as it is stated in the papers, is several feet deep in the bottom of New York Bay, and the very fact, supposing that there was no surface appearance of the sewage or

436 no odor, the very fact that people had left the Upper Bay entirely for bathing, gone away, it seems to me that that would have deterrent effect on people using the shores for enjoyment.

Q. Now you have got out of the field of æste*h*tics and into the field of imagination, haven't you?

A. Not at all. Imagination? We know that they don't use the north shore for bathing. Nobody bathes in the Kill von Kull. Nobody bathes in the Upper Bay. In the Lower Bay, of course, where there is that great sweep to the Ocean and where it is four or five miles from the Narrows the bathing still goes on.

Q. You say no one bathes in the Upper Bay?

A. I mean practically. There are no bathing resorts.

Q. Were there ever that you ever heard of.

A. I don't know.

By Complainants' Counsel:

Q. Mr. Adams, Mr. Riker has drawn to your attention the most potent facts in influencing mental and physical condition, that of environment, imagination, color and nature; I will ask you now if it is not a fact within your knowledge that environment not only moulds the mental attitude, brings out the criminal instincts, but actually alters the stature and physical peculiarity of the people?

Defendants' Counsel: Objected to as leading and irrelevant.

The Commissioner: Note the objection.

A. There is no question, doctor, that that has been demonstrated?

Q. And has not uncurbed imagination led to aber-ances that have led people into lunatic asylums?

Defendants' Counsel: I object on the ground that this gentleman has not qualified as an expert in lunacy.

437 The Commissioner: Note the objection.

A. I answer yes without question.

Q. You were asked about the influence of color by Mr. Riker; isn't it a fact that a whole school of medical treatment is based upon the effect of color on people's sensory organs?

Defendants' Counsel: I object on the ground that this cross-examination assumes a question which was not asked by me.

The Referee: Note the objection.

A. Oh, yes, Dr. O'Sullivan, there is no question that the Finsen system of treating skin diseases is based entirely on the influence of color, and insanity has been treated by color in Europe for 25 years, by the use of color.

Q. Doctor Finsen, the great Dane, was the one that focused attention on that?

A. Yes, has applied it to skin diseases and other physicians for twenty-five years before of course applied it to mental diseases.

Q. You were asked about odors, Mr. Adams, and about boating you introduced yourself; is one of the advantages of boating in our harbor waters the exposing of the body through the lungs to the effects of oxygen?

A. Unquestionably.

Q. And if foul, putrescent gases are substituted for oxygen is that injurious or beneficial?

Defendants' Counsel: I object on the ground this witness has not qualified as an expert.

Complainants' Counsel: These questions are all bases on your cross examination. You have qualified him through your cross-examination.

The Commissioner: Note the objection.

A. Yes, without question.

Q. In what way; state if you know, Mr. Adams, what effect cleanliness and clearness of water in harbor waters have on the
438 volume of excursion travel and on the patronage to shore resorts?

Defendants' Counsel: I object on the ground it is not redirect and not relevant or material.

The Commissioner: Note the objection.

Complainants' Counsel: You brought it out?

Defendants' Counsel: You can say so as much as you please, Dr. O'Sullivan, but I did not.

Q. There is no doubt that it has a very great influence. People will not bathe in polluted water, neither do they like to sail a boat on polluted water.

Q. Does your department make it necessary for you to familiarize yourself with the effect on the general health and the physical vigor and the personal disposition of communities by frequent examination in pleasant and agreeable places and resorts?

A. No, sir.

Q. I understood you to say in answer to a question of Mr. Riker's that the functions of your department aid in making better citizens?

A. Yes, sir.

Q. And would not the features that I have just imputed in my question influence in that direction.

A. Yes, most certainly.

CHARLES H. TOWNSEND, called as a witness on behalf of complainants, being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. Are you connected with any of the municipal pleasure or instruction institutions, Mr. Townsend?

A. Yes, sir.

Q. With which one?

A. I have been director of the Aquarium for about nine years and acting director of the Museum for one year.

439 Defendants' Counsel: Where is that Museum.

The Witness: Natural History, Central Park.

Q. Have you given any particular thought or study to marine life, Mr. Townsend?

A. Yes.

Q. Is that part of your duties, the knowe*l*dge incumbent upon one to have a knowledge of marine life, is that part of the duties of the director of an aquarium?

A. Yes.

Q. Have you had occasion to use our harbor waters at any time in supporting the fish life in the aquarium?

A. Yes, the water of the harbor has been pumped into the aquarium and is used there, a little of it is still used there.

Q. Have you ever given any attention to the subject matter of pollution, Mr. Townsend?

A. I have in connection with my work in the aquarium, my work some years ago in the United States Fish Commission and my summer canoe trips along the Delaware River.

Q. Have you written any treatise or pamphlets or works on pollution?

A. A little.

Q. Will you name some of them that you have written?

A. I gave an address a couple of years ago to the New York Anglers Club on the pollution of our angling waters which has since been republished several times. I have referred to the pollution of the harbor water a number of times in the annual reports of the New York Aquarium.

Q. Are you the author of any other pamphlets?

A. A great many on natural history but none other on the subject of pollution of the waters.

Q. Have you a copy of that address that you delivered on pollution?

A. I have brought it along.

Q. What year was this address given, Mr. Townsend?

A. I cannot tell you the date on that.

Q. This is dated March 17th, 1907, as the date of the
440 address?

A. That must be right.

Q. And the object of that address was to point out what?

A. To point out to the Association of Anglers a field of work for them to engage in and to show them that they might have very much better angling in our waters if the streams were protected from the various kinds of pollution which polluted them.

Q. Have you any direct knowledge of the condition of pollution in our harbor waters?

A. Yes, do you wish me to speak on the subject?

Q. And such knowledge you acquired in pursuance of your functions as Director of the Aquarium?

A. When I came to the Aquarium maybe nine years ago I found that the sea fishes living in the aquarium were kept in the water of the harbor. I immediately had salinometers bought and began daily observations on the salinity of New York Harbor, which *had* been continued to the present time. These records are voluminous and they show that the waters of New York Harbor are not sea water but brackish water, that it is very seldom more than half salt and it is generally nearly fresh. In the winter months the density falls

very low. The great mass of the water in the harbor is fresh water and not sea water during the winter months. In the summer months when the flow of the river is presumably less—I do not know just what the reason is but probably less, the density of the harbor water is a little higher.

Q. And by density you mean the increased salinity?

A. I mean salinity, that is the word I intended to use, salinity instead of density.

Q. Will you describe what you mean by a salinometer?

A. It is an instrument for measuring the saltiness of water. We use Hillgar's Ocean Salinometer. Fresh water has no salinity.
441 Sea water has a salinity which is recorded of 28. The water of New York Harbor is seldom more than 14. It is frequently as low as seven or eight. I have known of it one day to be five or six.

Q. What are the main features looked to in waters used for the support of fish life, what components are most essential?

A. I should say the purity of the water was very important. Under old conditions, that is when the tanks of the New York Aquarium were supplied with water from the harbor, the exhibits of the aquarium could only be kept up by constant restocking. It was an expense and a trouble and the water was discolored, was not pleasant to look at. I persuaded the Board of Managers to get for the aquarium a large reservoir and adopt the European method of stored sea water. We built a reservoir holding 100,000 gallons of sea water, chartered a tank steamer and got pure sea water from the vicinity of Sandy Hook Lightship, filled the reservoir a couple of years ago and we have used that water for the past two years instead of the harbor water for almost all the tanks in the aquarium. The only tanks which do not use that water are certain floor pools which are set so low in the ground that they cannot flow into it and they are remaining until better arrangements can be made, but as a result of the use of pure sea water we have cut the ordinary death rate of the sea fishes in the aquarium in two. We have just about half the collecting to do that we had formerly. We used to have to work hard to keep our tanks full of animals. They don't die on our hands as they once did. Our death rate is now normal and not a continued bother and a nuisance. I consider the water of New York Harbor unfit to keep fishes in for exhibition, I consider it unfit for the public to look at through the glass. We have three tanks of the glass frontage system still retaining harbor water. Any one wanting to see the difference between harbor water and pure stored sea water can see it. There is a decided difference.
442 Sometimes the harbor water is so dirty that you cannot see the collections. The stored sea water is as claer as crystal.

Q. What makes the difference in the harbor water and the sea water in color and its effect?

A. The sea water is pure; the harbor water is impure.

Q. By pure what do you mean? You mean free from pollution?

A. Yes, sir, free from pollution, pure ocean sea water.

Q. And what is the source of pollution in the Harbor waters?

A. I presume that there are two or three sources. I have looked over certain published maps which show a great many sewer outfalls in that region. The aquarium is situated at the Battery. There must be, in fact there are a number of sewer outfalls in the region of lower Manhattan on both sides of the Peninsula and on the Brooklyn side there must be a vast amount of sewage, which would serve to discolor the water. There must also be a considerable amount of factory waste pour into these same sewers, which may be more injurious to this fish life than the dirt that comes from the sewers. I do not know about that. I do not know that the water has been analyzed. I never had it analyzed there.

Q. But you practically ceased using the harbor water on account of the fatality on fish life?

A. That was the reason and because it was not pleasant to look at.

Q. How does polluted brackish water affect major fish life?

A. I am convinced from looking over certain old natural history books of this region that a considerable portion of the aquatic life of the New York Bay region has disappeared because the conditions are no longer favorable. Instances, cases, I cannot well recall at this moment. I know that a number of forms of fish and invertebrate life that once could be had in this immediate neighborhood can no longer be had here. We get those specimens no longer. If we want them we must go far afield. The little sea horse, that
443 is nearly always on exhibition at the Aquarium, used to be abundent right at the wharves here. It has not been taken here for many years, and yet our collectors are always on the lookout for interesting things.

Q. To what do you attribute the absence of that particular and the other general——

A. To the filling of the harbor by sewage, possibly factory waste; dangerous acids are probably present in factory waste, I don't know to what extent.

Q. You include house waste and factory refuse under the generic head of sewage, do you not, when you discuss pollution?

A. Yes, sir.

Q. I mean that is what you mean when you say the water is polluted here?

A. Yes, I mean they are polluted chiefly from what comes out of sewers and I presume that the sewers receive the acids of the factory as well as ordinary house sewage.

HENRY R. TOWNE, called as a witness on behalf of the complainants being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Plaintiffs' Counsel:

Q. Mr. Towne, are you connected with any of the large civic bodies of this municipality?

A. I am president of the Merchants Association of New York and a member of the Chamber of Commerce of the City of New York. I am also a member and Vice President of the American Society of Mechanical Engineers.

Q. You have been a resident of our city for many years, have you not, Mr. Towne?

A. For the past nineteen years.

Q. And you have been active in its municipal interests?

A. Considerably so.

Q. Through its civic bodies?

A. Though these organizations.

Q. Have you any direct knowledge as to whether or not the Merchants Association took any active part in investigating the polluted condition of our harbor waters, Mr. Towne?

444 A. It has long concerned itself with this subject. It has had a very active and efficient committee charged with this special matter and has published numerous reports concerning it.

Q. And has employed competent men to conduct investigations to inform itself through that committee?

A. It has made unusual effort to get accurate and reliable information.

Q. And that activity of the Merchants Association was prior to the appointment of any commission by the state or city to investigate these conditions, was it not?

A. I so believe.

Q. The attention of the Merchants Association to the general polluted condition of our harbor waters was directed in what way, if you know, Mr. Towne?

A. The general reason for our interest in and activity in connection with this matter has been the vital importance of the harbor to the commercial interests of this community. It is one of our greatest assets, one of the fundamental factors in the commercial growth and prosperity of the Port of New York.

Q. We had a gentleman testify a couple of days ago that the Port of New York conducted approximately 48% of the foreign commerce of the United States; does that agree in any way with your knowledge and experience?

A. It does accurately, and I might add in that connection, as a manufacturer and business man, that our industries are increasingly becoming dependent upon our foreign trade for their continued growth and development. The rapidity of that growth in recent years has been such as to more than keep pace with the growth of the country, and to furnish an excess of producing power which is finding its value in our foreign trade. For this reason all of our great manufacturing industries are directly and vitally concerned in whatever will tend to promote the development of that growth and the increase of our foreign market. Without the opportunity which this implies we would be speedily confronted with an excess of product beyond our absorbing capacity which would carry

445 with it necessarily the curtailment of the use of our productive facilities and therefore practically all of our industries, directly or indirectly, are concerned in everything that will promote and increase the growth of our foreign trade, and one great factor in that is the condition of the port and harbor of New York City through which about one-half of our total foreign commerce passes.

Q. When you state the port and harbor do you include the harbor waters in that or do you particularly mean the harbor waters?

A. I particularly mean the harbor waters because the harbor waters are an essential factor, possibly a determining factor in the efficiency of the harbor of the port.

Q. Is one of the functions of the two great bodies, *twe* great civic bodies that you have just stated you are a member of, is part of their functions to sustain and support by legitimate means the commercial *peremminence* of this municipality?

A. It is, and the motto of the Merchants Association is to "foster the trade and welfare of New York."

Q. And whether the necessary action to be taken would take the form of agitation, investigation, pressure on city or state officials, your bodies would undertake the necessary activity to achieve that result?

A. We would and we do endeavor to.

Q. Do you wish to make any general statement of your own knowledge, Mr. Towne, as to the condition of the harbor waters?

A. It seems to me that there are two phases of this matter; the one, first, which has already been referred to and concerning which I imagine you have other and more expert testimony, namely, the bearing of the condition of a harbor upon the trade and commerce of the port adjacent to it. In that respect this question touches the welfare of the commercial and industrial community because affecting, in turn, its facilities for increase with other countries and with our coastwise ports. The other and second phase of the matter as it seems to me is the sanitary phase as affecting the health,
446 comfort and welfare of the people of this great city. This side of the subject appeals especially to me for the reason that for nearly forty years I have been a student of sanitary engineering and have followed the development of that science and especially have noted the aspect of it as presented in the sanitary conditions of this city. These conditions are far from what they might or should be and one of the worst factors in the situation as it exists at present is the fouling of the waters of the harbor which surround and bisect the greater city. In earlier days it was permissable for a city to discharge its filth into the adjacent waters, but sanitary authorities the world over and one after another of the great cities have found it unpermissible and ultimately intolerable to continue this primitive method and have resorted to other and better methods whereby the vast amount of filth which must be disposed of as the refuse of any great city shall either be carried elsewhere to some safer and less harmful point of discharge, or if that be not feasible shall then be treated in some way prior to its discharge so that the effluent into the waters of the river or bay or harbor surrounding the city shall be practically relieved of impurities.

Q. Have you conferred with me relative to the testimony you have just given, Mr. Towne?

A. I never have had the pleasure of seeing you before this meeting.

Q. And you come here voluntarily and make your statement relative to these facts?

A. I do as a citizen and as a member of the organizations that I belong to and especially the Merchants Association of which I am president.

Cross-examination by Defendants' Counsel:

Q. Mr. Towne, I understand you to say among your other qualifications that you are a manufacturer?

A. I am.

Q. What do you manufacture?

447 A. Builders' hardware, locks and hoisting machinery.

Q. As a manufacturer are you or are you not a believer in a protective tariff?

Complainants' Counsel: Objected to. He believes in protection of the harbor, evidently.

A. I believe that our protective po-icy has been of great benefit to the country in the past and I think that it is doing great harm to our industries at present.

Q. Do you think the so-called Chinese wall that has been erected around our country, about which we read so much nowadays, has had any deterring effect upon commerce?

Complainants' Counsel: Objected to.

The Commissioner: Note the objection.

A. I do.

Q. Do you think that the tariff has had more influence upon commerce in New York Harbor than the condition of the water?

Complainants' Counsel: I make a general objection, Mr. Commissioner, to this whole line of tariff discussion, which is certainly irrelevant, and has not been broached or touched at any point by any testimony given on the direct by this witness.

The Commissioner: Note the objection.

A. They operate in different ways.

Q. I didn't ask you that?

A. Probably it had.

Q. As a member of the Merchants Association, as the President of it, and also as a member of the Chamber of Commerce have you been seeking to lower the tariff so that the interests of this city could be protected?

Complainants' Counsel: Objected to.

The Commissioner: Note the objection.

448 A. I have been somewhat active in trying to promote the passage of the pending Reciprocity Bill with Canada.

Q. I am talking about New York now?

A. And which I believe if adopted by both countries will benefit the commerce of the City of New York and greatly benefit both countries.

Q. I notice you do not answer my specific question which is with regard to the tariff affecting the port of New York?

A. I regard the reciprocity measure as included in your question.

Q. I ask you if you have used any efforts to reduce the tariff particularly upon those articles that you manufacture yourself as tending to increase the trade in New York City?

A. That was not my motive in making the effort but I have made such an effort.

Q. Now you have said that there were two phases in which you considered this pollution of the harbor of New York as deleterious, one a business one and second a sanitary one, and you have even said that you have studied sanitation for twenty or thirty years and that you found that all cities were gradually coming to the view, as I understood your evidence, that the old habit of pouring the sewage into the neighboring waters should be abandoned; is that the result of your investigation?

A. I said that one after the other of the great cities were doing that.

Q. Are you familiar with the experience of Boston?

A. Somewhat.

Q. They have not reached that conclusion, have they?

A. Long ago.

Q. *That* have?

A. Long ago. They built their great outfall sewer which carries the mouth or point of discharge way down the harbor of Boston to an island whose name I have forgotten, although I have been there and seen their great works which were necessary to accomplish it.

449 Q. They don't dispose artificially of their sewage, they don't treat it in any manner, they pour it into the water, don't they?

A. No, on the contrary they carry it into this island where they have great storage basins controlled by gates adequate in size to carry the cumulative discharge of the city over a flood tide and then open the gates at the beginning of the ebb so that the polluted matter contained in the storage tanks will be delivered on to the outflowing tide and carry it over eastward.

Q. It is all discharged into Boston Harbor, isn't it?

A. In the lower part of the harbor, far out.

Q. There is no treatment artificially of it as you suggest?

A. No, for the reason they have carried it sufficiently far towards the sea to make that unnecessary.

Q. Are you aware, in your study of twenty years, that several foreign cities treat their sewage in somewhat similar manner?

A. Yes, I saw the early works for the City of London for that purpose in 1866, then in process of construction and vastly increased since then, the purpose there being quite similar to that in the case of Boston.

Q. Now you say that you have the interests of the community at heart and I have no doubt that you have; do you recognize that

New York is dependent at all for its prosperity and success in life upon its suburbs?

A. Very largely.

Q. Do you recognise therefore and are you broad minded enough to take in the prosperity of the suburbs in New Jersey?

A. Absolutely. Commercially they are a part of the Greater New York.

Q. You realize that they have and always must the sewage they have to take care of, don't you?

A. I do and I should be glad to assist them in any way in getting rid of it properly.

450 Q. You don't think though it should go into the Hudson River?

A. Not in the Hudson River.

Q. I mean in New York Bay?

A. Unless reasonably purified.

Q. Into New York Bay?

A. Not unless carried well down to the lower end of the bay, unless purified.

Q. You think New York should have a monopoly of the pollution of New York Bay?

A. No, I think New York should put its own house in order as well as asking its neighbor to do likewise.

Q. Then you recognize the fact that New York has not got its house in order in that respect?

A. I do.

Q. And you with the other members of the association took earnest efforts I believe to stop the construction and use of this so called Bronx River sewer, didn't you.

A. We did.

Q. And were unsuccessful?

A. Unfortunately, thus far.

Q. And by very recent action a large additional amount of her sewage was poured right into the Hudson River by this sewer, was it not?

A. Absolutely, a considerable amount but relatively small in comparison with the total of the whole city.

Q. Do you know how much sewage is poured by the city into the waters?

A. I have not the figures in my mind.

Q. You have roughly, haven't you?

A. No, I have not.

Q. Well, all the sewage of five million and odd inhabitants of the City of New York and vicinity pours right into these waters does it not?

A. Into all of the waters surrounding the city, yes, to the best of my knowledge.

Q. Is any effort being made whatever that you are aware of by state or municipal authorities to change that?

A. I am unable to answer that question definitely.

Q. Don't you know that instead of efforts being made to
451 change it the very recent action with regard to the Bronx sewer is a step in the opposite direction, namely a step to continue it against opposition and litigation prompted by your association?

A. That was an effort to divert the flow of certain sewage from one channel into another. It did not alter the grand total.

Q. It was meant to preserve your harbor waters, wasn't it, and carry out the wishes and purposes which you have described here?

A. I don't understand it that that project had anything to do one way or the other with the preservation of the harbor waters.

Q. What was the basis of your opposition to the Bronx sewer?

A. Increasing contamination of the North River.

Q. Do you know of a single municipal or state effort that is being made to change the condition you have described?

A. Unfortunately I do not, although I believe that such efforts should be made and will be made under the increasing pressure of public opinion.

Q. Do you know of a single thing that the State of New York, if it is doing anything in this litigation, or the City of New York, is doing to improve the harbor and keep it free from pollution, except to prevent New Jersey from doing what it is proposed to do?

A. Not yet.

Q. Are you familiar with the plans that are expected to be carried out, if this litigation does not prevent it, by the Passaic Valley Sewerage Commission?

A. I have a general knowledge I think but it is some time since I have seen them.

Q. Are you familiar with the investigation that was conducted by the War Department resulting in the action that it took?

A. I was at the time.

452 Q. Were you aware that the War Department had withdrawn its opposition and discontinued its intervention in this suit because of its being satisfied that no injury was going to happen to the harbor by reason of the proposed work?

A. My understanding is that that statement is true but conditioned on the removal of a certain amount of the sludge matter of the sewage before it is discharged into the harbor.

Q. I didn't go into the details of what it was conditioned on, but you are aware then that the War Department is satisfied from the plans and methods which are proposed to be adopted that the work will not be a menace to the harbor and are so satisfied that they have withdrawn their opposition to it, have given their consent to it and have withdrawn from this suit as a party complainant?

A. I am aware of all of that but I am also aware that it has reference solely to the navigation conditions of the harbor and has nothing to do with the sanitation question.

Q. Did you ever read the petition of intervention that the government filed in this suit?

A. I think I did at the time.

Q. Don't you know that they referred to something else besides navigation, referred to pollution particularly?

A. I have no recollection that in the final action of the Government they considered the question of sanitation at all.

Q. I asked you if you were aware that in the petition of intervention filed by the Government the subject of the pollution of the Bay by the project was especially referred to and used as a ground of complaint?

A. That may be so; I don't recall it.

Q. And did you understand that the subject of pollution was considered by the Engineering Board that finally passed upon this thing?

A. My understanding is that the decision of the Board
453 was based upon the questions affecting navigation and not on questions affecting the sanitation.

Q. Mr. Towne, from the commercial point of view, directing your attention to the question of pollution of waters and harbors, do you know of any harbor in the world where the percentage of pollution is as low as in New York Harbor at the present time?

A. I pretend to no expert knowledge in these matters and would prefer not to answer such a technical question, but I have in mind the port of Hamburg, Germany, with which I have been familiar for thirty odd years and where I happened to be at the time of the Cholera outbreak there, which I think was in 1892, and I have followed from time to time the work of sanitation which has been done ever since, primarily to protect their drinking supply of water, but also for the purpose of cleaning up the harbor. Two summers ago I was taken on a trip through the harbor of Hamburg in a steam launch by a friend who was a resident and citizen of that great commercial city and I was astonished to note the change which had taken place in the condition of the harbor there. So far as was apparent to the eye and nose it is clean and wholesome and pleasant to look upon where formerly it was the reverse.

Q. Now, don't you know that there are two large sewerage systems discharging into this very harbor?

A. Of Hamburg?

Q. Yes?

A. I know that they discharge their sewage into it but my impression is that it is after purification or sedimentation.

Q. Do you know what the process is to which the sewage is subjected before it is discharged into the harbor of Hamburg?

A. My memory is at fault there. I can't say definitely.

Q. Do you know in comparison with the proposed plant of the Passaic Valley Sewerage Commission whether that method is more perfect or less perfect?

A. I don't know.

454 Q. Do you know the actual percentage of free oxygen in the waters of Hamburg harbor

A. I do not.

Q. Do you know anything of the average percentage of free oxygen in the waters of New York harbor at the point of proposed discharge of the Passaic Valley sewer?

A. I don't have the figures in my mind.

Redirect examination by Complainants' Counsel:

Q. Mr. Towne, in relation to the Boston outfall do you know whether they screen out all the course matter before they discharge at the outfall?

A. They do, it goes through a series of screens at different grades.

Q. Do you know that there is a suit now pending between the United States and the City of New York to compel the Bronx Valley Sewerage Commission to instal a disposal purification plant at the outfall of the Bronx Valley Sewer?

A. I have been so informed.

Defendants' Counsel: Is that for navigation or pollution?

Complainants' Counsel: Pollution. The interest of the United States in the suit between New Jersey and New York was entirely on the line of navigation; all the testimony and the action depended upon the sealing up of the channel.

Q. Mr. McCarter asked you, Mr. Towne, if you knew of any steps that had been taken by either the State or the Municipal Authorities in the direction of bettering the condition of our harbor waters, and I ask you in line with that inquiry do you know whether or not the State of New York appointed some eight years ago the New York Bay Pollution Commission to make investigations as to the conditions and to suggest remedies appropriate to bettering conditions?

A. That is my understanding, and I had forgotten that in answering the previous question.

455 Q. Do you know whether or not if subsequent to that some five years ago a commission created by Act of the Legislature and of which the Mayor of this great city was permitted to name the commissioners to continue the line of investigation and work with a view to determining scientifically what the conditions here were that were complained of by your body and other great civic bodies and to report thereon with suggested remedies for improving the condition?

A. I do. That is quite right. My previous answer had reference, however, rather to works of activity that to works of investigation.

Q. And irrespective of who pollutes these waters the bodies that you represent, Mr. Towne, will agitate and bring pressure to bear upon them and compel them to do their duty as far as lies in your power?

Defendants' Counsel: I object to that. The bodies that he represents can speak for—he can only speak for himself.

The Commissioner: Note the objection.

A. I believe that all of these bodies in proper ways at proper

times will unite in urging the municipal and state authorities to take up this great question and to find a practical solution of it.

Q. Do you recall, Mr. Towne, the fact that the State of New York, through its Department of Health, is now and has for several years past been declining numerous applications for the construction of sewers by cities and towns on the Hudson River and its tributaries unless steps were taken looking to the treatment of the sewage that they proposed to discharge?

Defendants' Counsel: I object to that. The representatives of those bodies will speak for themselves; hearsay evidence.

The Commissioner: Note the objection.

456 A. Such is my understanding derived from intercourse with those concerned with those matters.

ALFRED R. CONKLING, called as a witness on behalf of the complainants, being first duly sworn, testifies as follows:

Direct Examination by Complainants' Counsel:

Q. What is your full name?

A. Alfred Reynolds Conkling.

Q. Where do you reside?

A. Borough of Manhattan, City of New York.

Q. What is your profession, sir?

A. Attorney at law and owner of real estate; trustee of several estates, for five years President of the New York Realty League and now second vice president of that association of taxpayers.

Q. Have you taken any particular interest in city government and city affairs and matters like the one we are now discussing, the subject matter of pollution?

A. I have for about twenty-five years. I wrote the first book on city government in the United States in the English Language, which I have here, the first popular book. I was Alderman in 1887 and 1888 in Mayor Hewitt's administration. I noted the weak point of our city government. In 1893 I went abroad and visited Berlin and Birmingham, England, as two very well governed cities and devoted the greater part of that summer to studying city government, and gathering material for that book. That book was published about September, 1894, just before the election of Mayor Strong on a reform city ticket, and from that time on, a period of about seventeen years, I have made a special study—in fact outside of my legal profession it has been my chief occupation and line of investigation.

Q. In the course of your examinations as to municipal conditions in Europe had you occasion to visit the sewage farms of any of the larger cities.

457 A. I had, especially the City of Berlin. I was a student there after graduating at Yale in 1872 to 1873. The conditions were then terrible. The drainage of the city was bad and it was a very unhealthy place, and I returned to Berlin

chiefly to see the improvements which had been made under the direction of the illustrious Virchow, who was professor in the University of Berlin, a member of the city council and I think a member of the Prussian Parliament, a special honor conferred by Kaiser Wilhelm, the grandfather of the present Emperor of Germany. I lived in Berlin on a little river which they called the Spree, (pronounced by witness Spray); the Americans or English call it Spree, a stream about like a brook in our country, forty to fifty feet wide, and when I returned in 1893, I went to the so-called Rieselfelder, or sewage fields. We called them sewage farms outside of Berlin. There I saw a vast alluvial basin filled with the drainage, the liquid drainage of the great city of Berlin, streams and canals through this vast alluvial meadow. They raised some vegetables there and I remember seeing some workmen in some of the trenches. I said to myself—I need not speak German—I said to myself in German, the translation of which——

Defendants' Counsel: I don't think we care what you said to yourself in any language; we want to have evidence.

A. (Continuing:) This is no longer Berlin, it is a heaven state—himmelstock—the changes in the great City of Berlin from this drainage, which city was so unhealthful while I was there as a student to these model sewage farms that I spoke of it to myself as a heavenly state. Then to speak of the City of Birmingham, England, which is a city of, at that time, I think of about 500,000 persons. The river Lea, so called, a stream twenty or twenty-five feet in width received the sewage of Birmingham. The abutting owners below the city by legal proceedings, I suppose, in the
458 Court of Chancery, enjoined the city from turning the refuse or sewage into this stream. Accordingly a large alluvial basin below the city was bought or leased, I forgot which, for the sewage farms. A large number of cattle were put on these farms and fed on grass, and some vegetables were raised for the benefit of the city. In other words the liquid sewage was used to the benefit of the city. Again in the City of Paris, at the village of Asnieres, six or eight miles below the heart of the city, the main sewer, the trunk sewer, which they call the great collector in English, in the translation of it, was turned on to this soil below Paris and there many vegetables were raised which I was told were sold in the best restaurants in Paris. Now there are three cities, Paris, Berlin and Birmingham, England, where the sewage farm system was used to great advantage. I might say that in Paris that they do not throw the sewage into the Seine. They have a proverb which goes "nothing into the Seine, everything into the sewer."

Q. Were those sewage farms operated not only to the health and the comfort of the people but at a financial profit, do you know?

Defendants' Counsel: Objected to as immaterial and irrelevant.

A. Certainly for the health and comfort and sanitation of the citizens of those cities, but as to the financial side I regret I cannot testify.

Q. Coming nearer home, are you familiar with Tuxedo Park?

A. I am, sir. I have been a member of that club for about twenty years and have been going there for about twenty-five. The club is 25 years old on the 1st of June. I am an owner and trustee there. I know the Passaic Valley. I have been going up there for twenty-five years. I appeared before the Harbor Line Board in December, 1908, two and one-half years ago, and suggested
459 as *to* the cheapest method of solving the Passaic Valley Sewage problem for the State of New Jersey to lease or buy the Hackensack meadows and to screen the sewage, separate the sludge from the liquid and to treat the sewage in the Hackensack meadows chemically, and have the clear or practically clear inoffensive water flow into our harbor. I walked across the Hackensack meadows about six weeks ago in the back of Hackensack. They are about a mile wide but as you approach the Erie tunnel they are probably five or six miles, the map speaks for itself, so that there in my humble opinion is ample space, thousands of acres, possibly a million acres which the State might buy I suppose at nominal cost because they are better in their condemnation proceedings than we are. They are quicker and surer than we are, and this sewage from Paterson and the Passaic Valley could be treated there, and I think the suggestion which I make and which I made originally, I don't know of any one else suggesting it, would be I think satisfactory to the State of New York.

Q. And you think that this could be made as profitable in growing vegetables as the sewage farms that you describe in Paris and Berlin?

A. I think so because in slow, old fashioned England it is done to advantage in the middle of the little island with no outlet. I have another suggestion to make in regard to a canal to the Jersey Coast, can I bring out that?

Q. Yes, if you please?

A. I suggest as a second and more expensive solution I think of the problem, a drainage canal from the vicinity of Patterson across the alluvial soil of New Jersey to the ocean, the outlet to be about 15 or 20 miles from Sandy Rook, possibly Point Pleasant Bay. That is not the correct name. What is the name of the bay at Point Pleasant?

Q. Barnegat Bay?

A. That's it, Barnegat Bay. The Chicago drainage canal which is described in that book there of Mr. Brown's, I might say if you want it as a comparison—if you want as a comparison to bring up the Chicago canal——

460 Q. I don't think so; we hope to avoid all the blunders they made and we hope to stop New Jersey from——

A. I can testify it is perfectly feasible to dig a canal there at reasonable cost through the alluvial soil from Patterson down to the ocean and to drain that valley.

Q. Now you said you were familiar with the Passaic Valley; what was the condition of the Passaic River if you know, as to pollution?

A. Very foul and dirty. I cross it about—well I cross it all the

year round and I want to say that the city of Passaic has grown wonderfully in the past ten years. It has a population of 90,000 according to the newspapers, and with that vast population ever increasing, and as a resident of New York, I look upon the drainage of that valley to New York harbor as a very serious menace to our health and sanitation.

Q. Are you familiar with the present condition of the harbor waters?

A. Not chemically so.

Q. Generally?

A. They are very foul and dirty and ill smelling.

Q. Are they as bad as Newark Bay or the Passaic River?

A. I know that the residents of Newark for a great many years have complained of the Passaic River. I could hardly say if they are as bad or worse that the Passaic River at Newark.

Cross-examination by Defendants' Counsel:

Q. Mr. Conkling, I don't know whether the relation between the publication of your book in September, 1894, and the election of Mayor Strong was anything more than a coincidence, or was it cause and effect?

A. The book was written before Strong got the nomination, and printed too. I made a bet on the issue of that book and my recollection is it was published and before the public before the nomination.

Q. Well, I notices that in this book you say, page 155, "the scientific solution of the great problem of sewerage in those
461 cities is worthy of the consideration of municipal authorities throughout the world. American cities are generally built upon the seashore or upon the banks of a river having sufficient current to carry off the sewage." Upon that theory I suppose your view would be that New York is entirely justified in disposing of the sewage in the way that it does?

A. At that date, but not now. I am opposed to the Bronx Valley sewer and the Yonkers sewer.

Q. You have seen a great light since then?

A. I have in seventeen years.

Q. You want to expurgate that phrase from your book, do you?

A. I must stand and fall on that book but I am a progressive, sir. I have learned something in seventeen years.

Q. Now in Berlin they have some area of fi-ty square miles that they devote to this disposal system, do they not?

A. It is very large, I couldn't tell you the size.

Q. Doesn't that system involve a porous soil?

A. Yes, the North German Plains are an alluvial soil.

Q. Are you aware of the character of the soil of the Hackensack Meadows to which you refer as a possible way of disposing of this sewage from the Passaic Valley?

A. There is no rock in sight there, I haven't examined the soil chemically.

Q. Isn't it a fact that it is of a character that would absolutely

prohibit its use for the purpose that you name; isn't it wet, muddy, impervious like rubber?

Q. I walked across it six weeks ago and I didn't find it very muddy. I found it rather good for walking between Leonia and Hackensack.

Q. Isn't it founded on blue clay making it a perfectly solid body like rubber, impervious to filtration?

A. I think not.

Q. Where do you propose to run this canal, through the
462 City of Newark?

A. From Patterson southeast to the Jersey coast.

Q. Patterson, southeast; now through what locality would you take it?

A. I didn't mark it on the map, the exact location, or the exact direction of the canal, but of course I know it is possible to drain a valley in that way.

Q. Did you anticipate making Newark a Venice with a grand canal running through its center?

A. Not quite as bad as that.

Q. Where would you get the water from to fill the canal?

A. From the Passaic Valley, Passaic River and tributaries.

Q. You would obstruct the water from the river and put it in this grand canal?

A. Build a main canal below Patterson to take in the sewage of Patterson.

Q. What is the length of this proposed canal?

A. I can give you approximately; I haven't the map before me. Newark, I think, is, I should think it would not be much over 45 miles and the Chicago drainage canal is about 23 and built through rock.

Q. Was this to be an open canal?

A. Yes.

Q. Why not leave the Passaic River as it is then?

A. And go into Newark Bay and so on to the harbor?

Q. Continue then from the Passaic River at Newark Bay or Kill von Kull down to Point Pleasant?

A. That would be cheaper I think.

Q. Then you would leave the polluted Passaic just as it is with all the troubles that now come from it?

A. The people of this town don't care about the Passaic River. We are looking out for our own harbor.

Q. The people of New York are something like Artemus Ward, just leaving his wife's relations and go——

A. (Interrupting.) Let the dead past bury its dead, look out for our own harbor, charity begins at home as well as sanitation begins at home.

463 Q. You think that New Jersey, bordering on New York harbor, and having property interests there, has no right to avail itself of the *property* that you say on page 155 of your book prevails in all such situations, namely, of pouring the sewage into the river?

A. Of course I testified that if you treat the sewage chemically

on the Hackensack River then dilute it and make it on inoffensive fluid it might flow into the harbor without any inconvenience.

Q. Are you aware of the present system of our sewage commission, what they propose to do?

A. No, sir, I am not.

Q. Have you any idea what the project is?

A. As I have not read your report I think I ought not to be asked to testify about it.

Q. You don't know?

A. I have not seen the report.

Q. Do you know it involves the separation of the solid from the liquid?

A. That is so elementary I should think so. That is done all over the world.

Q. And do you know that it involves large settling basins over in New Jersey long before it gets to New York harbor?

A. I naturally imagine it would if it is a thoroughly scientific investigation and report.

Q. Did you know that it had received the sanction and approval of the Federal Government?

A. I did not.

CHARLES H. TOWNSEND, recalled.

Direct examination (continued):

By Claimants' Counsel:

Q. Mr. Townsend, will you add any fact that has come to your knowledge directly relative to the harbor pollution or rather the pollution of these harbor waters?

A. I have not been a special student of this subject and I became interested in it chiefly in connection with the Aquarium and the desirability of getting a water supply that would carry our sea fishes. I feel pretty sure that the public does not realize that
464 the water of New York Harbor is more fresh than salt. If it were pure sea water there would be more animal life to assist in the dispersal of waste. Many sea animals are carniverous. Many of them are scavangers. There is not so much animal life in fresh water as there is in the waters of the sea. The sea abounds in animal life. If this sewage were poured into the Lower Bay, for instance, instead of the Upper Bay, it probably would not have accumulated the large deposits on the bottom which the enquiries of the Sewerage Commission have shown it does accumulate, and there would be more animal life down there to assist in breaking it up and disintegrating it and consuming it. Then the increasing sewage and doubtless the factory wastes of the city that go along with it aid in dispersing the minute animal life that is useful in destroying wastes like sewage, and with increasing sewage there would be a tendency to disperse the very animals that assist in destroying sewage, they would themselves become dispersed. It seems to me that there should be no more sewage allowed to escape into the waters of New York Bay and that every possible effort should be made to reduce

the amount of sewage now being put into the Bay, and I feel that the next generation of New Yorkers will have settled that question and that sewage will be disposed of in some other way than by pumping it into the Bay.

Cross-examination by Defendants' Counsel:

Q. Mr. Townsend, is there a different class of fish in salt water than fresh water?

A. Yes, there are a few species of fishes that live habitually in the sea and run into fresh waters to spawn. The shad is a species which is popularly believed to have been seriously affected by the pollution of the Hudson River and of the mouth of the river in New York Bay. I am not personally posted on that point, but people tell me that——

Defendants' Counsel: Never mind what they tell you, it is
465 incompetent.

A. I am of the opinion that the pollution of the Hudson River and the pollution of the Bay has affected the shad fishery.

Q. Will shad come back to a river to spawn where they have not been hatched?

A. Shad can be introduced to new waters, young shad can be planted in rivers that never held shad before and they will take hold there.

Q. Are the fish in your Aquarium salt or fresh water fish?

A. Both.

Q. Which predominated?

A. We have equal numbers of both; the fresh water side of the house is supplied by the Croton water system.

Q. So that the water that you took from the Bay, or from the Harbor was for the salt water fish?

A. For the salt water side of the house.

Q. And they needed salt water, didn't they?

A. They needed salt water. Many of them were fishes which inhabit brackish waters such as you find wherever brackish and sea waters mingle. We have an abundance of the local sea fishes which are no longer abundant about our wharves. We must get them a little further away or bring them from others bays that are not polluted. They will no longer live in these waters.

Q. Where did you get the water before you got it out to sea, how near to the Aquarium?

A. Pumped it right there at the pier.

Q. How far is Robbins Reef from the aquarium, roughly?

A. I couldn't say how many miles, I am not familiar with the distances.

Q. About four miles?

A. I should think it was at least that.

Q. Now, your investigations with the salinometer were designed, I suppose, to ascertain the quantity of salt?

466 A. Yes.

Q. And not the quantity of pollution?

A. Not so much.

Q. Am I right about that?

A. Yes.

Q. Do you know how far the tongue of fresh water that comes down the North River goes?

A. It goes well past the Battery because its influence on the harbor is to make the harbor more fresh than salt, the Upper Bay. I couldn't speak for any neighborhood further south than the Battery.

Q. Your investigations with the salinometer have been entirely at the Battery?

A. At the Battery.

Q. Not south?

A. Not south of the Battery.

Q. And the percentages of salt water that you found were from water taken right at the Battery?

A. Yes.

Q. Have you ever studied from an hydraulic standpoint the relation between the tongue of fresh water coming down and the tidal prism of salt water going out?

A. I have not.

Q. And where were your salt water tests made, from water taken at the surface or lower down?

A. There is an opening under the Aquarium into which water flows through the sea wall and we pump from that rather than have a pipe sticking out over the sea wall which would be broken off or injured.

Q. Well, it was practically at the surface of the water?

A. Oh, yes.

Q. And you found it more salty in Winter than in Summer? ?

A. Our pump and pipe is inserted deep enough so that it will pump water at low tide.

Q. I asked you when you find the larger proportion of salt, Winter or Summer?

A. The harbor is more salty in summer.

Q. Then the fresh water stream is lower?

A. Yes, sir.

Q. Now I observe in your lecture that you gave to Anglers
467 you speak of the fact that the Hudson River is polluted practically along its entire length; that is a fact, isn't it?

A. That I believe to be a fact.

Q. Do you not advert to the fact that some 135 villages, cities and towns pour their sewage into the Hudson River before it reaches New York City?

A. Yes.

Q. Now, what is it that drives fish away, is it pollution or something else?

A. I am not prepared to answer that question, haven't studied it to that extent.

Q. I judge from your evidence, which has been very carefully given, if I may be permitted to say so, that you think that waste from factories is probably more deleterious to fish than that we commonly speak of as sewage; am I right?

A. Yes, there may be other things in the material that comes from the sewage outlets that is as bad as the ordinary waste from houses that we call sewage.

Q. Isn't it a fact that fish live a good deal upon sewage; I am not speaking of factory waste?

A. Yes, I should say that there might be some kinds of scavenging sea animals, there are some kinds of scavenging animals that would feed on such waste and decayed matter of that kind, as for instance the crabs, many of the crabs are scavengers.

Q. Do you know anything about the extent of oxygen that is required for fish life in water?

A. No, but there must be an abundant supply of it.

Q. You don't know the amount?

A. No.

Q. Do you know whether or not it is true that large catches of fish are made in the Boston Harbor right at the outlet of the sewer to which reference has been made in the testimony today?

A. No, I am not posted on that.

JOHN Y. CUYLER, called as a witness on behalf of Com-
468 plainants, being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. You are a resident of this city, Mr. Cuyler?

A. I am temporarily residing in Westchester County but Brooklyn is my home.

Q. And you have been a resident of the city how long?

A. Well, practically all my life, sixty or seventy years.

Q. Seventy years in this great municipality?

A. I was born in New York City.

Q. Now, are you connected with any of the civic bodies of our municipality, Mr. Cuyler?

A. I am a member of the Special Committee of the Merchants Association on the pollution of waters of the State of New York. I am a member of the Civic League of Westchester County and I am a member of the Executive Committee of that league.

Q. Were you in the library here when Mr. Adams, of the Municipal Art Commission I think it was, was testifying?

A. Yes, sir.

Q. Did you hear distinctly his remarks relative to the economic value of beauty which aroused comment from my friend Mr. McCarter?

A. I did.

Q. Have you ever been engaged in any civic enterprise which would improve the appearance or aid by beautiful environment in moulding our citizens?

A. Yes, I have a diploma of the American Society of Civil Engineers and I have made a special practice of landscape architecture for a great many years. I succeeded Frederic Law Olmsted in his

superintendency and I was the Chief Engineer and Superintendent of Prospect Park and of the small parks in Brooklyn and Boulevard.

Q. You mean Prospect Park in Brooklyn?

A. In Brooklyn and Coney Island for nearly twenty
469 years. I designed a similar park in Pittsburgh, the Albany Park, Washington Park. I designed a couple of parks for our New Jersey friends in Paterson and in Bayonne and in other cities. I was connected with some work in Chicago.

Q. But not in Newark?

A. No, sir.

Q. Mr. Cuyler, what is the object of a park, of what use is it to a municipality.

Defendants' Counsel: Objected to as irrelevant.

A. The prime object of a park is to cultivate a taste for refining influences and associations with beauty and very strongly, incidentally, to furnish means for recreation with such association as would probably dominate and influence the mind to better thought and cultivation of taste.

Q. Do you think that a good park system in a municipality influences the health and mental well-being of citizens?

Defendants' Counsel: Objected to as irrelevant.

A. Undoubtedly.

Q. Do you know whether or not environment influences character and citizenship?

Defendants' Counsel: Objected to as irrelevant.

A. I only know in the sense of contact with my own judgment and the operation of my mind and with such association. I for instance was a member of the Board of Education in Brooklyn for twenty odd years. I made a special point of cultivating the use of the parks and a portion of Coney Island which was under our control for communities of children. We secured ultimately in the use of the park practically all the picknicking that was done in the City of Brooklyn, in opposition and in preference to the old style of going out of town on excursions by railroad or steamboat to different
resorts that were provided for that purpose, and in talking
470 with those who had charge of those, churches of every denomination came to the parks where we provided several localities and usually I arranged for notification so as to give people a special privilege on that day; we arranged tables and seats and swings and police supervision such as was necessary and a supply of fresh water, and incidentally the use of the appliances like the boats and the carriages and the little Merry-go-rounds and things of that kind, and invariably in discussing the effect, because it was always a subject of interest to me, the testimony was always in favor of the use of the parks for that purpose in preference to the other because we shut out a great many meretricious influences and brought them in a contact with the other side of things. In the first place, we had a beautiful meadow where the children were allowed to roam at

will. We had beautiful groves of trees. We had fine collections of flowers, some statuary, some stone work, beautiful lake and things of that kind, so that, coming back to the first proposition, I haven't any doubt that in my professional experience those associations exert a great influence in elevating and instructing the mind on a high plane.

Q. Now, did any of those parks embrace part of the seabeach at Coney Island?

A. Yes, sir, the Concourse at Coney Island, 3,000 feet long and a thousand feet wide was secured by the City of Brooklyn and placed under the absolute control of the Park Department and so it became a part of my special work to supervise and control. It was located on the most eligible portion, at that time, of the beach, lying geographically between the Manhattan Beach property or Brighton Beach property and the railroad property, Culver's Road on the west and in those early years we constructed some shelters, open shelters for the use of the people, cleaned up the beach, and kept it clean from refuse, etc., and policed it so that women and
471 children should have unrestricted access to the beach in summer time and other portions of the year without cost and other expense than the mere fare that carries you to and from the Island.

Q. And the object of all that was to furnish fresh air and clean water and beautiful surroundings?

A. That was the idea; in contradistinction to the ordinary means of access to the beach, that prevailed in earlier days, the same shanties and commoner buildings, where a person was hardly expected to go unless they expended money, we wanted a place where the women and children could go without cost and would be free from all contact with disagreeable or annoying conditions. We had it policed so that the women and children could go there and spend the day without any annoyance and we made provision for the sale of very simple products of food at a very nominal price. Instead of charging an extravagant price for the privilege we fixed the prices ourselves, the Park Department did, both at the Island and in the parks, in order that the people who have the means ordinarily to get refreshments should be able to do so without spending a great deal of money.

Q. Now, what particular function has the Committee of the Merchants Association with which you said you were connected to do with the harbor conditions?

A. Well, the Committee was appointed, as I understand it, originally with a view to more intimately inform the Merchants Association of the state of the waters, or condition of the waters throughout the state, where in many directions there was creeping in all sorts of means of pollution, and with the effect of ultimately, we believe, destroying not only many of the proper uses, either commercial or otherwise, but eliminating them, as points of attraction even, as portions of the Hudson River from the mouth here up to its very source, all up through the upper counties; the waters that flow into Lake Champlain and Lake Champlain itself, and inci-

dentally the tributary waters to the North River, and the
472 condition of the water itself in the North River. I recollect the pollution of the ice, the agitation of which came through this Commission and probably led to very marked modification in the method of producing ice for this great city, and then ultimately the conditions which were associated with the building of the Bronx sewer. We opposed the building of the sewer, not that a sewer was not necessary, but we believe there might be another outlet in the first place to this sewer, and on the other hand it having been determined to make the outlet the Hudson River that the proposal was to have the sewerage treated before it was drawn into the Bay. The people who controlled it had political power enough at the time to carry it through without making that provision. It was a very senseless thing from an economic point of view, in my judgment, because ultimately, undoubtedly, they will be compelled to do it, but that issue now I understand is before the court. It has led to the removal of the commission. Governor Dix within a week signed a bill which removes the old commission and subjects them to a special inquiry as to the work which they have done.

Q. And you believe that was part of the outcome of the action of the pollution committee of the Merchants Association?

A. Yes, sir, very decidedly.

Q. And you instituted legal proceedings of some kind, did you?

A. Yes, sir, the services of your department were drawn into operation very effectively in conjunction with representatives of the United States Government.

Q. And did you employ people to make special examinations or investigations from a scientific standpoint of the harbor waters?

A. Yes, sir, in examining the condition of the water more particularly the relation to the locale of disease in the city, we employed experts to secure data concerning the presence of flies,
473 for instance, along the harbor, and incidentally learned through that means the existence and presence of a great deal of undesirable material that was floating upon the waters and held in suspension and carried to and fro by the action of the tides along the water front.

Q. Mr. Cuyler, why does the Merchants Association through its Pollution Committee oppose the operation of the Passaic Valley Trunk Sewer?

Defendants' Counsel: I object to that? He can't tell why a committee acts. He can tell what they do.

Complainants' Counsel: I withdraw that question.

Q. Mr. Cuyler, are you now a member of the Pollution Committee of the Merchants Association?

A. Yes, sir.

Q. Are the views that you are giving here the views that you have been delegated to impart at this hearing on behalf of the Pollution Committee of the Merchants Association?

A. I think so, yes, sir.

Q. Why does the Merchants Association through its Pollution Committee oppose the operation of the Passaic Valley Trunk Sewer?

Defendants' Counsel: Wouldn't it be just as easy for you in putting these questions to ask this gentleman for his knowledge upon the subject; he can't tell what other people think.

Complainants' Counsel: It is not what they think, it is why they oppose this. He is sent here officially to represent a given body. I am not asking him for his views but for the views he is delegated to come here and impart at this hearing.

Defendants' Counsel: If it was some official action it would be correct; if it was not—he can't tell what other men think.

474 Complainants' Counsel: I have not asked him about their thoughts, Judge. I have asked him why they opposed this.

Defendants' Counsel: I have my objection on the record.

A. As I understand it the Committee was delegated to oppose generally, to work in opposition to the tendency which prevailed very generally through portions of the state and the Hudson River and the environments of New York the pollution that prevailed. It had no special point directed to the scheme of New Jersey to make provision for the relief of the valley, which is of course a very essential and very vital thing to New Jersey, unquestionably, but in connection with the work of the Committee through other parts of the state it came down to the Bronx Valley and feeling that the proposition of the Passaic Valley Sewer, the whole having a tendency to load the waters of New York Bay and harbor with polluted material. Whether overloading it or not it was not for the Committee to determine. The object of the committee, I think, primarily, was to sound a note of warning to indicate the property menace which lay in the proposition with the increased population along our whole line in attendance upon the use of these streams and the bay for sewage deposits, and when we met before the Army Board the point there at that time was not to oppose absolutely the use of the harbor for a place of deposit for the sewers, as I understood it, but the engineers came before that Board with imperfect plans, lacking in detail, which rendered it impossible for those who examined the plans at that time and the Army Engineers particularly to determine whether a proper means of caring for that sewage was going to be made or not, and as I remember then those plans went back to our friends in New Jersey for modification, and as I understand it they have been modified since, and since then the Government, I believe the Government, has with-

475 drawn certain of its opposition.

Cross-examination by Defendants' Counsel:

Q. Mr. Cuyler, Brooklyn has been pouring into the East River and harbor of New York its sewage in a raw condition, has it not, for years?

A. Yes, sir.

Q. And not a great while ago it built sewers even so low down as Bay Ridge, did it not?

A. Yes, sir.

Q. Did the association of which you are a member, the Merchants Association, protest against that Bay Ridge sewer?

A. We didn't protest I think against that individual sewer, we commenced in Brooklyn more particularly with relation to the conditions in Newtown Creek, and the shores and the condition of Gowanus Creek, and I think perhaps it is partially owing to the intervention of that committee that the work was stimulated with reference to the relief of Gowanus Canal.

Q. How long has the agitation of the Merchants Association been in vogue, this note of warning that you referred to?

A. This particular Committee, the Merchants Association, have been acting in many lines for a great many years. This particular committee was formed some four or five years ago.

Q. Have you succeeded in getting up to date New York, by that I mean Greater New York, to modify in any way whatever its practice of pouring its raw sewage into the several rivers that are contiguous to Brooklyn and New York City?

A. I think the work so far might be designated as a campaign of education, for the simple reason that this body has no official status, but I believe we have stimulated a good deal of activity on lines which we believe will result in good in the future. All those things have to start somewhere. We went up into the House and we fought there some interests that, unless it was stopped, would tend to ultimately destroy some of the most desirable and beautiful features of the waters of the Adirondacks and Lake Cham-
476 plain and so on. We went up into the head waters of the Hudson River and succeeded in modifying conditions there which locally were undoubtedly very beneficial. Just how far they reacted we don't know. We believe that the fight against the Bronx Valley Sewer will have a good effect, because we believe that no sewer hereafter is likely to be constructed with an outfall into the Hudson River for any considerable community without protest if not the absolute legal action of the authorities of the state and of the locality itself. We believe all those things will have that tendency. With reference to the City, it is a large undertaking for New York to consider. It will come, perhaps, in the course of time, but this Committee laid before not only the City Authorities but the State Authorities the data and facts of their dereliction in the matter of dealing with the more advanced idea as to the disposal of sewage. We believe that is going to have its effect too. If it were desirable, if there was any point of view from which such a thing could be done, the City of New York could be legally mulcted in millions of dollars for violating the laws which exist on the statute books today, and some day we hope there will be relief. Instead of making New York entirely the dumping ground for sewage there will be some means of intercepting it. For instance New York City has just given authority for the engineers of the city to inaugurate a filtering plant for New York City, ulti-

mately costing ten or fifteen million dollars. We believe that has come out of the exposure of the conditions of the watershed itself which for years has been an open sewer, and in that way this Committee has tried to influence the public mind through the main association, and I think we have.

Q. I don't want you to get the impression that I was minimizing the influence of your committee; I think they are
477 quite potential; have you followed since the hearing before the Harbor Board what has transpired with regard to this proposition to dispose of the sewerage from the Passaic Valley in New Jersey?

A. No, only incidentally as I understand it your authorities have gone over your plans and perfected them and have eliminated conditions that were objected to at that time and made complete and perfect the details which as I remember the plans did not show at that time; in other words, as I understand it, you propose to render innocuous to a large extent the material as to the condition of which, not treated, our original objection was made.

Q. You have no doubt of the feasibility of that plan, have you?

A. I haven't any doubt of the feasibility of such engineers as you have employed to make a plan. As I say I have not seen the plan. I believe it is possible, an engineering possibility in the light of science and experience today, if you give us money enough to deal with that question.

Q. On the assumption then, with what you say with regard to the modification and greater amplification of the plans and detail, &c, you would feel that the work of agitation which the Committee of the Merchants Association started has been to a large degree successful, would you not?

A. Well, I think so in a very humble way that we do accomplish something by producing this agitation; I do not know how much. I shouldn't undertake to say how much influence. Any good method of bringing about this agitation would probably have produced the same results.

Q. The opposition that you had then to this project is not so acute as it was?

A. No, it never was acute except in the matter—from an engineering point of view of operating plans that would do as had been suggested, treat that material so as to render it practically innocuous. Its disposal in that immense volume of water could be so ar-
478 ranged.

FRED B. DALZELL, called as a witness on behalf of Complainants, being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. Mr. Dalzell are you directly connected as a member with any of our large civic bodies?

A. Yes sir.

Q. Which of them?

A. I am Vice-president of the Maritime Association of the Port of New York.

Q. Are you connected with any other civic bodies?

A. I am a director in the New York Board of Trade and Transportation, Vice-President of the National Board of Steam Navigation, President of the Association for the Protection of Commerce, which only consitutes owners of tugboats.

Q. Has the Board of Trade and Transportation organized a Committee to investigate the pollution of the harbor?

A. They have.

Q. Now I understood you to say, Mr. Dalzell, that you were Vice-president of the Maritime Association or Exchange?

A. Yes, sir.

Q. You are that now?

A. I am.

Q. I want to bring your attention directly to matters that have come within your knowledge here in regard to the effects of these polluted waters on the hulls of ships and on the metals of ships; now will you state in your own way, Mr. Dalzell, what direct knowledge you have on matters of that kind?

A. I am the managing owner of eight tugboats which do a general towing and passenger business in the harbor and of course have to keep them in repair, and we find that certain places in New York Harbor where our boats navigate or have to lay up, particularly lay up at night, the action of the gases, foreign matter in the water, is very detrimental to the hulls, sheathing of our boats, particularly in a place like Newtown Creek. We find if we lay a boat up
479 there over night the gases or acids or whatever pollution there is in the water, the action of those destroy our paint and affect our metal, of course, this sheathing.

Q. Now, what metal have you noticed the effect of these putrescent gases on, this foreign matter in the water upon?

A. Copper is what we use on our tugs.

Q. And have you taken the trouble to discover whether that change in the copper was due to erosion or corrosion?

A. General wear is the only thing we notice. That is what we suppose was for natural conditions.

Q. It was not due to friction or worn-off?

A. No, when the sheathing is put on, our tugs being wood, the paramount reason is to protect us from the ice conditions, but we have not had much ice to contend with in the last few years, we have never given the question of what made it wear out any serious consideration and we have accepted the conditions as we found them and when they were worn we replaced them. The worse trouble we find is, as I say; the entire hull of these craft are not coppered all the way to the keel. It is just a foot above and probably three or four feet below the water line. The balance of the hull is natural wood but over which we put specially prepared copper paint to protect it from animal matter and such other conditions as we find in the waters *when* we operate. We notice our paint will discolor. Then we have great objections on the part of our employers about sleeping aboard

the tugs at night when lying in the slips. There are very few slips in New York that you can lay a boat in that you are not within 50 or 100 feet of a sewer, they are so close together.

Q. And to what do the crews object?

A. Foul air.

Q. Foul gases?

A. Foul gases.

Q. Do you know of any cases of illness that were traced to those gases?

A. Not directly. We are a pretty healthy lot aboard of a
480 tug-boat.

Q. Now, how do these putrescent gases affect the paint?

A. Turns it black.

Q. Do you know that of your own knowledge?

A. Oh, yes.

Q. As I understand it your interest is not sentimental or æsthetic or on any other grounds than those of the chemical effects of the polluted harbor waters upon the craft that you know of?

A. Yes, sir.

Q. It is purely commercial?

A. Absolutely. Our desire is to aid in doing such things as will keep New York in the position it has always maintained and that has been the greatest port in the world. In order to do that we must keep the depth of water to permit the largest sized vessels to come in here and use the port, and to do such things as we can not to fill the harbor up. Of course, the Government keeps dredges here going all the year around pumping out matter that is deposited here which tends to lessen the depth of the water.

Q. But if the water should ever get much more polluted than it is would that endanger the hulls of vessels more than the description you have given us of the injury sustained?

A. It certainly would, beyond a doubt.

Q. And that would impair the efficiency of this port of entry would it?

A. Yes, sir.

Q. In the tugging business it brings you in direct contact with all sorts of shipping?

A. Every kind imaginable.

Q. From an ocean liner down to the smaller craft?

A. Yes, sir.

Q. And tugs would have to go to different parts of the harbor waters?

A. Yes, sir.

Cross-examination by Defendants' Counsel:

Q. Mr. Dalzell do your tugs go down as far as Robbins Reef?

A. Yes, sir.

Q. What occasion have they to go down there?

481 A. They go there about twenty or thirty times a day towing Standard Oil Company barges, oil tank steamers. We pass there when we go to our repair yards at Port Richard, Staten

Island where we repair our boats and have two under repairs there now.

Q. The principal trouble you have had with the copper bottom has been in the slips, hasn't it?

A. I think so, because when we are under headway we go about ten or eleven miles an hour.

Q. And your boats lie in slips right where sewers empty too, don't they, as a rule?

A. I said a minute ago there is hardly a place that you can lay where you don't get that unless you go to Jersey, and we can't go to Jersey because we can't use their water in our boilers, it is too impure.

Q. What is the life of the copper bottoms of your boats eaten in as they are by these slip experiences?

A. I suppose 10, 12, 15 years, I suppose a suit of metal will last on one of our boats.

Q. That is under present conditions?

A. Yes, sir.

Q. What would be its life in some place where the water is perfectly pure?

A. I am not sufficiently expert on that. I have operated always in New York Harbor.

Q. And the troubles that you have described are the ones you have always had?

A. They first commenced here 33 years ago.

By Complainants' Counsel:

Q. I didn't catch what you said in regard to the use of New Jersey waters, why you were unable to navigate New Jersey waters?

A. I didn't say navigate. He said, speaking of laying the boats up on the New Jersey side, I said we have to lay in where we take in fresh water for our boilers, our boats are high pressure tugs
482 and we cannot use the fresh water of New Jersey because of the impurities we think there is in it.

Q. New Jersey fresh water is so impure that you can't use it in your boilers, is that it?

A. Yes, sir not without great detriment.

Adjourned to June 29th, at 10:30 A. M.

483 Supreme Court of the United States, October Term, 1910.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

299 BROADWAY, NEW YORK CITY, June 29th, 1911.

Before James D. Maher, Esq., Commissioner.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York.
William A. McQuaid, Esq., Deputy Attorney General, and
Dr. William J. O'Sullivan, Special Counsel for The People of the State of New York, Complainants.
Edmund Wilson, Esq., Attorney General of the State of New Jersey.
Robert H. McCarter, Esq., of Counsel for the State of New Jersey.
Joseph Coult, Esq., and Adrian Riker, Esq., of Counsel for Passaic Valley Sewerage Commission, Defendants.

EDWARD HAGAMAN HALL, claled as a witness on behalf of complainants being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Complainants' Counsel:

Q. What is your profession, doctor?
A. I am a writer and lecturer on American history and American scenery.
Q. Have you any academic degrees, doctor?
A. Yes, sir, degree of Master of Letters from New York
484 University and Doctor of Letters from Hobart College.
Q. Are you connected or related with any of our civic bodies?
A. Yes, sir, I am secretary of the American Scenic and Historic Preservation Society; the secretary of the Association for the Protection of the Adirondacks; I am Historian and Assistant Secretary of the Hudson-Fulton Celebration Committee, which had particularly to do with the celebration of the Hudson River. I was at one time for a few years the Secretary of the American Mosquito Extermination Society.
Q. Have you been connected with any Association or body that considers the condition of the Hudson at any time, doctor?
A. Well, in connection with the American Scenic and Historic Preservation Society, which for short we call the Scenic Society and the Hudson Fulton Celebration Committee, I have given a good deal of attention to the Hudson River waters.

Q. Will you state what that attention, or if it took the form of investigation, or whatever form it took, was?

A. Well, we have been particularly interested in the mainenance or the restoration of wholesome and attractive conditions along the waters of the Hudson so as to make them more attractive for those who are interested in the scenery and the history, and then of course those specifically, and then for the general conditions of habitability and attractiveness. We have learned from our studies and from the observations of old citizens that the quality of the waters in the river has been changed materially owing to the great growth of population. Is it proper for me on the witness stand to say what I have learned from others, or must I confine myself to things of my own knowledge?

Q. We will come to that a little later, doctor; now what are the activities or objects of the society that you describe for the extermination of mosquitoes?

485 A. Well, that society has practically gone out of existence now as an organization. Its object was to conduct a campaign so as to educate communities to the necessity and the desirability of exterminating mosquitoes as carriers of disease.

Q. And were the investigations of that society on scientific lines to demonstrate the fact that mosquitoes were carriers of disease?

A. Yes, sir.

Q. What are the objects of the Historic and Scenic Preservation Society?

A. The object of that society is to cultivate a sentiment in favor of preserving the natural scenery of the country, the attractive scenery, for the benefit of the people, and preserving and maintaining their historic land marks, erecting monuments where they do not exist and also administering properties, either public properties or properties given to the society in trust for such purposes.

Q. What possible practical value has the activities and work of such a society on every day citizenship?

A. Well, we feel—in the first place there is a very fundamental connection between history and scenery. It is a subject I could go into at great length, but just to give you a suggestion of this connection the same natural factors which make beautiful scenery have been factors in directing the course of human events; for instance the rivers of the world have been the first channels of civilization; therefore you will find that the great rivers are sturdy rivers, great history has been enacted along their banks; you find historic places along the banks; you take for instance bold scenery, hills, prominences and marked elevations which are characteristic of the scenic splendor and you will find them very generally associated with historic events. Military men, for instance, always pick out commanding elevations for their fortifications, therefore you find them associated with distinguished events in history. You take in

486 the early settlement of any community, the prominent members of the community, the leaders, perhaps, you might say the more wealthy ones, have the first pick of the best sites for their residences, the commanding sites for instance like eminences at the

northern end of this island where Alexander Hamilton lived, where Washington made his headquarters, and things like that immediately become associated with history; therefore those two ideas were united in the operations of this society. Now we believe that the enjoyment of beautiful scenery—I will take up that idea first—beautiful scenery of outdoor life. It aids the physical welfare of people; it brings them into the open air; it changes the line of their thoughts; relieves them of the strain of business life and possibly domestic worriments, and benefits them physically. In the next place we believe it makes them better citizens for it makes them familiar with the historical traditions of the locality or the state or the country to which they belong, and familiarity with traditions and a respect for them I consider a very powerful factor in good citizenship. A community is governed perhaps more by its traditions and its respect for traditions than by its laws, as many excellent authorities will state. Then again I believe that wholesome environment makes better citizens. Take in the matter of cleanliness just as people who live in squalid surroundings and environment are naturally depressed, if you can improve those conditions it lifts them up just one peg in the scale of living. It enlarges their thoughts. It is like the difference a man feels when he changes his clothes. If he puts on a good suit of clothes he feels differently. And so it is when you clothe a man with better environment, he feels better. He is a different man.

Q. Do European governments give much attention to the influence of scenery and historic preservations and matters
487 of that kind on their citizenship?

A. Yes, sir I believe that practically every civilized country in Europe and to a certain extent the Oriental people do so. In Great Britain, for instance, Parliament has passed a law called the—I can't remember just what the title of the law is—it is the antiquities law by which provision is made for the preservation of their great landmarks there, from old castles and preserves and literary landmarks for the purposes of which I have spoken. The London County Council makes appropriations of public moneys for putting up tablets on the places where famous literary people and statesmen have lived. In France there is a Commission des Monuments Historique, or as we would say a Commission of Historic Monuments. A historic monument there is any building, chateau or forest or anything else pronounced to be a historic monument which is very carefully preserved for that purpose. In Italy they have very stringent laws for the preservation of their landmarks and their works of art. You take Turkey, Egypt, they have similar laws, and then in China they have the highest respect for their historic monuments. I am not familiar with Japan.

Q. And the object of these various activities and the preservation of these historic landmarks is what, to create ideals?

A. It is to perpetuate the traditions of the country and to preserve physical objects which tend to maintain the best ideals of the country.

Q. What effect has cleanliness upon citizenship?

Defendants' Counsel: We feel as if we should enter a protest and objection against all this line of testimony. Of course we understand that the Commissioner is powerless to control the situation but it does not seem to us to bear in any way upon this issue. We do not
488 recall that there is a word in the Bill of Complaint to justify evidence of the supposed relation between æstheticism and good citizenship or anything of that kind, and without undertaking to object to each of these questions and answers we want to note on the record our feeling and protest against burdening the record at great expense with further evidence of this kind.

Complainants' Counsel: This whole line of testimony is urged as necessary from the standpoint of complainants in that we have great civic bodies, some of them with selfish interests like the Chamber of Commerce, some of them with æsthetic interests like the Art Commission, and some of them with sentimental and idealistic interests like the one represented by the gentleman now on the stand; and we will later connect the activities of these various bodies with the elevation of the citizenship of this city and show that a material element in the creation of the well recognized good citizenship of this great metropolis is largely due to the independent activities of these bodies who come here through their representatives and enter formal protest in their testimony against the pollution and destruction of the beauties and healthfulness and the utilities of our harbor waters.

The Commissioner: Note the objection of defendants' counsel.

Q. What effect has cleanliness upon citizenship?

A. That question was covered in brief by my former answer, in which I described the physical and the moral effects of these activities I have spoken of.

Q. In the activities of your society towards preserving the
489 scenic beauties is it part of their interest to see that the air and water are kept as clean as it is possible to keep them?

A. Yes, sir, decidedly. We believe that the proper usefulness of the public parks bordering on public waters is due largely to the proper conditions of the waters washing those parks. We have urged strongly the creation of various public parks, state and municipal, along the Hudson River, and in conjunction with other organizations have been successful in some instances, and we look forward to the time when there will be a larger proportion of public parks at the water side in the Borough of Richmond and along the harbor, and we believe that the maximum usefulness of those parks which now exist and which will undoubtedly, must necessarily be created in the future, will depend upon the proper condition of the bordering waters, the waters which wash their shores.

Q. Are you familiar with the historic landmarks in our harbor?

A. Quite familiar, yes, sir.

Q. What historic landmarks and historic positions are identified with our harbor and our harbor waters?

A. Well, that would be a pretty long answer to go into there.

Q. Some of them?

A. Of course Staten Island—I will change that. The waters of our harbor and the lands bordering thereon were the first portions of the State of New York to be visited by white men, by Europeans, and therefore Staten Island, the island itself becomes a great landmark. When you come to details on the island you find various communities down there which were settled at an early date by the Dutch and later by the English colonists all of which have their historic associations. You take, for instance, Tottenville, at the extreme southern end of the island, containing the Phillips Billop house, going back nobody knows exactly how far, but back early into the English period, with its very interesting historic associations, which I
490 will not take the time to enumerate. At the northern end of the island you have the site of revolutionary forts, and other interesting sites, which I should have to make a memorandum of in order to tell you all there are.

Q. To put the matter in rather a group idea, isn't it a fact that the harbor waters of New York were the scene of great activity during our revolutionary struggles?

A. Yes, sir, the whole revolution, the strategic revolution turned on the control of New York Harbor and the Hudson River.

Q. Now, doctor, do you know of your own knowledge people that used these harbor waters, in motor boats and other craft, to examine and familiarize themselves with the various points of interest from an historic standpoint?

A. Yes, sir.

Q. Mr. McCarter in an objection which was rather general to your line of testimony emphasized the fact that he saw no bearing in that testimony on the subject matter at issue; I wish now to ask you a question—have our courts recognized other than official uses in water than those for commercial purposes?

Defendants' Counsel: I object to that on the ground this gentleman has not qualified as an expert in law.

Complainants' Counsel: I press the question.

The Commissioner: Note the objection.

A. Yes, sir.

Q. Do you know that fact of your own knowledge?

A. Yes, sir.

Q. In what way have the courts recognized other beneficial uses of water than those relating to commerce?

491 A. In answering that question may I ask you when you say "our courts" whether you refer to the courts of the state or the United States?

Q. I mean it in the very large sense of any courts in the United States jurisdiction?

A. There has been within the past few months a very remarkable and interesting decision by Mr. Justice Lewis of the United States Circuit Court in Colorado upon this subject. It is practically a pioneer decision which establishes a precedent of unusual interest. Our society was particularly interested in this decision for this reason: We are custodians by law of certain state properties in the State of

New York. Among those is a part of 1,000 acres of land upon the Genesee River embracing the famous Portage Falls and Carriage called Letchworth Park. This was given to the State of New York by the late William Pryor Letchworth and by law placed in the custody of our society. There is a proposition to build a dam below those falls and divert the waters from those falls, taking the water around and discharging it into the river around and below the park, thus depriving the park of those waters. Last October we read in the telegraphic dispatches that the Hon. William E. Lewis, District Judge in the Circuit Court of the United States, in and for the District of Colorado, sitting at Pueblo, Colorado, had rendered a decision in the case of the Cascade Town Company, complainant, against the Empire Water and Power Company, defendants, in a case almost but not entirely parallel with our case at Letchworth Park. I therefore personally wrote to Mr. Justice Lewis asking him for a full copy of that opinion or decision, whichever you lawyers call it, and he was kind enough to direct that a copy be sent to me, and I hold in my hand a copy from that original copy which he sent to me. In that opinion he says upon the subject of the beneficial use of water that the term

"Beneficial uses" as used in section 6, Supra,—in order that
492 I may quote literally, will the stenographer please begin with this sentence; "Nor has the term beneficial uses as used in section 6, Supra been definitely fixed and limited in its meaning".—and then he goes on to give an opinion upon what constitutes beneficial uses. He says, among other things, after mentioning various commercial uses, "the public health is a beneficial use and for that purpose, among others, a city may condemn streams of water. The water when so obtained may be used and is used in any manner that will promote the public health and its use for sprinkling the streets, etc. Rest and recreation is a beneficial use and for that purpose water is used to make beautiful lawns, shady avenues, attractive homes and public parks with fountains, lakelets and streams and artificial scenery. * * * No one questions but that public health, rest and recreation is a domestic use as well as a beneficial use. No one, we may add, questions the right to these uses. * * * In one sense there is no commercial value to fountains and the parks. They do not bring in a revenue but they are vastly beneficial to the public health, rest and recreation and such fact is recognized the world over and there can be no question but that water applied to their maintenance and creation is a beneficial use." Then he goes on to say that the wholesome influence of waters on the surrounding *atomphere* is a beneficial use, and it seems to me, aside from the opinion of the court in this case, that it stands to reason that if such are beneficial uses of water then water in a pure condition which does not give off obnoxious exhalations, which does not float material for disease carrying insects to carry disease is water put to a beneficial use.

Q. Have you devoted any thought or attention to pollution of waters in other parts of the world.

A. Not very extensively nor scientifically, but as a layman I have

observed in Holland, where unusual conditions exist, and
493 where almost every canal is a sewer, so to speak, that they take extraordinary precautions to keep the waters of the canals as clean as possible. Now in the whole of Netherlands, or Holland, as we commonly call it, there is a population just about equal to that bordering the harbor of New York, little over five millions I believe. The sewage of that whole country, however, is discharged into canals over an area of about I think 12,000 square miles, whereas in New York the sewerage of this same population is discharged into a comparatively small area. Nevertheless, over there, they take great precautions to see that this water is pumped out of the canals because Holland being naturally below the level of the sea they have to use artificial means to get it out into the sea. They take great pains to see that the water has a circulation when it is pumped out into the sea so that it cannot get back, and even under these conditions, as I have observed in Leyden, they sometimes give off noxious gases.

Q. Have you made any observation as to the polluted condition of our harbor waters here in New York Bay, any general observations?

A. Not technically but in a general way, I have, yes sir. I have observed—your inquiry was with respect to the waters of New York Bay?

Q. Or the estuaries, East River, Hudson River, Harlem River, Bronx River?

A. I have visited the shores of those waters frequently and observed collections of filth in the still waters, particularly in the marshes.

Q. Have you visited the waters on the Jersey side of the Bay, any of them, Newark Bay or Passaic River?

A. I have visited them but I was trying to recall if I had observed these conditions particularly there. I have in mind especially—I do not know whether this is fairly a direct answer to your question—but if the waters of the Hudson River are pol-
494 luted above New York City then with the addition of the pollution coming from Jersey and from Newark Bay they must be more polluted down here. I can say that I have observed dead fish in large quantities on the shores of the river above caused by the polluted condition of the waters.

Q. Is there anything that I have failed to elicit by my questions that you think would be pertinent to the inquiry here as to the pollution of our harbor waters or as to the desirability of keeping them in a fairly sanitary condition?

A. I might add that I think that the matter of the public health is directly related to the use of the adjacent lands, the habitibility of the adjacent lands for the ordinary purposes of life as well as for scenic and historic purposes. If the conditions are such that unsanitary matter is discharged into the waters, particularly if it lodges in the quieter waters on the marshes or in the marshes so that disease bearing insects can take up germs and transfer them to these

lands or parks it very seriously militates against the proper and the rightful beneficial use of the lands adjacent to this harbor.

Q. And what effect will that have on the health and comfort and material as well as mental well-being of the inhabitants?

Defendants' Counsel: Objected to; the witness not being competent to answer.

The Commissioner: Note the objection.

A. I think it would be a very bad effect. It does not seem to me that, as an ordinarily intelligent citizen, I do not think that a person needs to be a scientist or expert on such a question, but as an ordinarily intelligent citizen it is my opinion that such conditions have a very deleterious effect.

Q. And would make for bad or good citizenship, which?

A. Bad citizenship.

Cross-examination by Defendants' Counsel:

Q. Where did you find these dead fish you spoke of, Doctor Hall?

A. It was at Stony Point.

495 Q. Where is that?

A. Stony Point is about thirty miles up the river.

Q. From New York City?

A. Yes.

Q. And they were dead from pollution in the stream?

A. So far as I could learn; I made inquiries at the time.

Q. Is it your idea that pollution so that any intelligent person could note it, that mere pollution in a stream bordering on a community is of itself unhealthy?

A. I think so, yes sir. I should say the pollution of a stream which leaves unsanitary materials along the edges, as I said before, was.

Q. Well, doctor, what do you define to be the pollution of waters for streams?

A. Briefly the injection into them of fœtal matter or offal refuse and so forth.

Q. And any amount of such matter injected into a water in your judgment pollutes it?

A. It is a question of degree, of course.

Q. I didn't ask you about degree, I asked you whether in your judgment it pollutes the water?

A. Yes, sir.

Q. And that pollution in your judgment renders that water unhealthy to the inhabitants who may live on the shore of it?

A. That depends upon the degree.

Q. Now, what is that degree of pollution, if you know?

Complainants' Counsel: I object to that question because this witness has not qualified as an expert in the phases and degrees of pollution that are inimical to health. His testimony has dealt entirely with the influence of polluted waters in general and questions of citizenship and physical well-being.

The Commissioner: Note the objection.

A. I should say that that degree had been reached either when it reaches the stage where it exhales noxious gases which are either injurious to the health or offensive to the senses, when it
496 reaches the stage where it deposits along the margins of the river unsanitary and unwholesome materials, or when it deposits such material upon drift wood which may be picked up and this conveyed into the community——

Q. And until it develops some specific sensory evidences of that character do you think the pollution has become dangerous to the health of the inhabitants dwelling on the shores of the water?

A. It may.

Q. Of course it may, but in your opinion does it?

A. Yes, sir.

Q. Now, taking the latter hypothesis what degree of pollution in your judgment reaches the danger point where it is not evident to the senses as you have stated?

Complainants' Counsel: I object to the question. It is clearly addressed to an expert on sanitary matters to which this gentleman has not testified.

A. I should say it had reached that point, as I stated before, when it deposits unwholesome matter along the margins of the river.

Q. That is a sensory evidence of it which I desire you to exclude; you said you thought it reached the danger point without having any of these particular evidences appear; now I want to know what degree of pollution in your judgment reaches that point where this evidence does not appear?

A. That would have to be decided by chemical analysis and I cannot answer as a chemical analytical expert.

Q. You don't know anything about that matter, do you doctor?

A. I know enough of chemistry to know that such may be the case but I cannot tell you the degree.

Q. Upon what element, chemical element, if you know something about chemistry, does the health and purity of waters depend?

Complainants' Counsel: Objected to. That question is
497 clearly impossible to answer because there are so many elements in chemistry and no one exists in isolation throughout this universe.

The Commissioner: Note the objection.

A. As I say I am not an expert but my recollection is from my former chemical studies that sulphurated hydrogen which may exist in water is very offensive.

Q. I didn't ask that, I asked what element is essential to the purity of water, not what element may render it impure?

A. I didn't understand that to be your question.

Q. That was the question, you misunderstood it; "Upon what element, chemical element, if you know something about chemistry, does the health and purity of waters depend?"

A. Pure water, I understand, consists of two elements of hydro-

gen to one of oxygen. The purity therefore depends upon these elements in proper proportion.

Q. You have never heard of the element of free oxygen in connection with the purity of water?

A. Yes, sir.

Q. Do you know what degree of free oxygen is essential to the purity or healthfulness of waters in streams and harbors?

Complainants' Counsel: Objected to on the ground of indefiniteness. It is not a question of degree, it is a question of percentage of oxygen in waters that determines the value of their oxygen.

The Commissioner: Note the objection.

A. I cannot tell you the percentage.

Q. Do you know the average percentage of free oxygen in the waters of New York Harbor?

A. Do I know the percentage?

Q. Yes?

A. No, sir.

Q. Do you know the percentage of free oxygen in the waters of the City of Amsterdam in Holland?

A. No, sir.

Q. Do you know how the waters of Amsterdam compare in purity and healthfulness with the waters of New York Bay?

A. No, sir.

498 EDWARD HATCH, JR., recalled.

Direct examination by complainants' counsel:

Q. Mr. Hatch what first led you to take an active interest in the pollution of New York Harbor?

A. I had made some study of the pollution on Lake Champlain caused by the pollution of the waters on some property that I owned.

Q. Was the work of investigation and abatement of the pollution of Lake Champlain carried on by the Pollution Committee of the Merchants Association.

A. No. When I found that this pollution was on the lake shore—my attention was called to it several times before that—and finally I took an interest in it and had some of it analyzed and I found that the pollution was due to the pulp mills on the Ausable River and also on the Bouquet River and I saw it was likely to become a nuisance, and I wrote to the mill owners and asked them if they would not put in some sort of device which would keep the stuff out of the river and consequently out of the lake. They told me it was none of my affair and then I had personal interviews with them and they dismissed the matter and I was told to go to a place of higher temperature, or something like that, and I went to Albany, and I made application to the State Department of Health and they made an investigation and said that the question was so serious that I should appeal to the Governor. I appealed to Governor Odell and

he ordered an investigation and found that all the contentions that had been made were justified, but he went out of office at that time and nothing was done. I then took it up with his successor, Governor Higgins, and followed it up with him for two years and just as he went out of office he ordered an investigation and that investigation *com*firmed the former one, I didn't seem to get anywheres then so I took it *so* the United States Government on
499 the Navigation Law. They made an investigation and said that the fouling by the refuse——

Defendants' Counsel: I do not think the results of those investigations should be mentioned by this witness. They will speak for themselves.

Complainants' Counsel: One thing, I wanted to make it appear at this point that this witness speaking for the Pollution Committee of the Merchants Association, and for their activity, wishes to disclose the fact that their activities have been general and have applied to the whole subject matter of pollution wherever found. With a little patience I will develop that idea.

Q. I will put this question to you, Mr. Hatch: have the activities of the Pollution Committee of the Merchants Association been directed solely to the portending pollution of the Upper Bay by the Passaic Valley Sewerage Commission?

Defendants' Counsel: I object to the question on the ground it is immaterial and irrelevant and that the activities of a body not a party to this litigation is entirely immaterial.

The Commissioner: Note the objection.

A. The Merchants Association Committee had not been formed at the time of the Lake Champlain matter, when the Lake Champlain matter was first taken up, but after that committee was made up the pollution of Lake Champlain lapped into the activities of it. Then we took up the matter of the Bronx and the Passaic Valley sewers, and the Upper Hudson aroun*f* Ft. Edward, made a petition to the Governor then. Then both sides of the river were petitioned from Albany down and a petition sent to the Governor. Those activities existed at the same time that the Passaic Valley sewer matter was pending. We had the several irons in the fire in that way.

Q. Did you conduct an investigation of the matter of flies
500 as a medium of infection from polluted shores, docks, piers and slips, to food supply markets, and matters of that kind?

A. Yes.

Q. Was that part of the activity of this independent investigation conducted by the committee, the Pollution Committee of the Merchants Association?

A. What do you mean, independent?

Q. Independent of any state or city action?

A. Yes.

Q. Did that Committe- investigate oysters as a means of transmitting disease?

A. Yes, we did.

Q. Did the investigations of the pollution of the Hudson River extend to above Albany and to the pollution perpetrated by the pump and paper manufacturing industries situated at Glens Falls, Ft. Edward, Hudson Falls and other cities of the upper part of the state?

A. Yes, we petitioned the Governor for an investigation, which was made, and the result was that the State Board of Health declared that the Hudson River was a public nuisance at that point.

Q. Did this Pollution Committ- of the Merchants Association investigate on the pollution by the Gowanus Bay Canal?

A. Yes.

Q. And investigate as to the influence of the proposed flushing out of that canal?

A. Yes, the original plan for the Gowanus Canal was to take the water from Buttermilk Channel and throw it into the head of the canal and flush it out on ebb tide down along the shore and taking the contents of the other sewers.

Q. Did the investigation of that Committe- extend to the sanitary condition of the Jersey meadows particularly as storage ground for stable manure as breeding grounds for flies, also an investigation relating to bone piles and other offensive matter?

501 A. Yes, that was done because we ascertained that a great number of flies were bred on the manure piles there and an appeal was made to the President of the Erie Road and also to the Pennsylvania and they said that they would have them removed at once which they did, and the bone piles were in the fertilizer factories there, and it was said that the bones there were brought from Egypt, and I thought they were likely to have germs there, the plagues. I investigated the matter and I had to do it myself and I went there and got the bones and had them analyzed but found they were not human bones, that they were beef bones and that sort. The idea was that if the flies were breeding there they were breeding and carrying these germs to the water front in different ways from the polluted material.

Q. In conducting these investigations did the Pollution Committee of the Merchants Association have chemists and bacteriologists working in conjunction with them?

A. Yes, the best we could get.

Q. Were investigations made relative to the proposed Passaic Valley Trunk Sewer which provided for the sewerage of the entire Passaic Valley and its outfall at Robbins Reef?

A. Yes, the investigation had been made there.

Q. Did the investigations of the Committee extent to the Bronx Valley Sewer?

A. Yes.

Q. Were investigations made relative to the railroads traversing through the Croton watersheds as affecting our water supply?

A. Yes, with regard to the closing of the toilets mainly, traversing the watershed, and toilets were closed there.

—. Did the Pollution Committe- of the Merchants Association

undertake to influence steamships with a view to regulating their discharge of garbage and other offensive matter into the harbor waters?

A. The State of New Jersey and the people of Coney Island complained that the scows in New York were dumping in their garbage and it was making it very offensive along the shore. I was asked to look into it and I found after about two months, I found
502 that it was the steamships that were the offenders, that the coastwise and also the Trans-atlantic steamships would keep their sewage until just before the- entered the harbor and would clean ship. I have a picture of the Lusitania throwing out twelve barrels of garbage right off the Statue of Liberty. I took that evidence and went to the steamship companies and asked them if they wouldn't stop it and they said they would and they have. They incinerate now all their garbage in the boilers of the vessels.

Q. Have the investigations of this said Committee of the Merchants' Association undertaken to examine conditions in the other boroughs relative to the construction of sewers and matters of that kind and their outfalls, and have they undertaken to arouse the activities of the Commissioner of Health of the State.

A. Yes, we made an investigation of the number of sewers in regard to requesting the Governor to fine the municipalities for a violation of the law, and at that time, the last time I wrote him, the fines amounted to $67,000,000—up to about $89,000,000 now—which are due as a penalty for violation of the law by the City of New York for discharging sewage without the proper forms.

Q. Now during these very active investigations through competent chemists and bacteriologists that you have described, have you gone further than merely criticise and watch these pollutions; have you undertaken to make suggestions of a feasible series of disposal plants for this garbage?

A. Yes, I designed some such disposal plants which were to be placed at the foot of streets; that is at a group of streets the sewers would intercept and then at certain streets they would have screening chambers and sedimentation beds built in the streets the same as the subway is, and the sludge would settle there and after being screened, and it was designed at certain times, say every week or so, that a steamer would go there and take out the sludge and
503 take it to sea, the same as they do in Manchester. Of course if this sediment went into the harbor and had to be dredged out at great expense it would be simply a matter of taking it out where it could be handled with better facilities. It was so arranged that only the domestic sewage and the first flush of a rain storm would go into these beds and then bypaths would take it into the river when it was comparatively purer or less foul.

Q. Has the Pollution Committe- of the Merchants' Association investigated the ice supply of New York City?

A. Yes, sir.

Q. And as to its freedom from pollution?

A. Yes, we asked the State Board of Health to make an investigation and they said they could attend to their own affairs and do it when they got ready, so we sent our own chemists up and took sam-

ples of the ice from Troy down and found it was very much polluted; of course water in freezing purifies itself but it was this system of cultivation that we have which would make that strata of pollution which we found full of germs, disease germs of all kinds. I don't know that they found many Typhoid but intestinal germs and other germs disease producing.

Q. Has the Merchants' Association put the subject matter and the results of these investigations in pamphlet form?

A. In some cases. We have a book on sewage disposal. We call it The Battle of the Microbes. Then we have the pollution of New York Harbor as a menace through the dissemination of disease germs, through the agency of the common house fly. We also have another, the House Fly at the Bar, which was the result of the opinions of all Health authorities prominent health authorities in the United States.

Q. What was the object with which the Pollution Committe- of the Merchants' Association had these books printed and disseminated?

504 A. With the idea of calling attention to the dangers of pollution. That was our object.

Q. This propaganda work?

A. Yes, sir.

Q. Educational work?

A. Yes, sir, it spread all over the country, and then the Merchants' Association—it grew too large for them—the American Association took it up and we had another Fly Committee.

Q. And many of these activities were precedent to any action by the state or the municipality and all of them have been independent of the state and municipality action in investigations?

A. Yes, they have been independent but they have worked along at the same time.

Q. Have you taken an active antagonistic position against the proposed Passaic Valley Trunk Sewer scheme?

A. Not at all, I have told them that. I have told them they didn't care for my assistance or anything like that but as far as the State of New Jersey is concerned we have co-operated with Mr. Herbert and have had many meetings in regard to sewage disposal plants, of which they have quite a number in other parts of New Jersey, and they are very serious about the thing. When I wrote to Mr. Gibson speaking of our attitude about the matter he never acknowledged the letter I wrote him. He didn't answer first off but I finally pressed him and he said the matter of the Passaic Valley sewer was a local matter entirely, had nothing to do with their country and the rest of New Jersey was not interested in it. I also addressed a letter to Mr. Wickersham, based on an objection that Mr. Harrison, your engineer, made.

Q. Who is Mr. Harrison?

A. He is one of the engineers for the Passaic Valley sewer. I have the letter here if you would like to hear it.

Q. Let me see it?

(Paper handed to counsel.)

505 Q. What date did you send the letter to the Attorney General, Mr. Wickersham?

A. August 3d, 1909.

Q. What was the general tenor of that letter?

Defendants' Counsel: Objected to as immaterial and irrelevant.

The Commissioner: Note the objection.

A. The letter is here. The purport of it was, I said, "In view, therefore, of the absolute disregard of the official recommendation made by the Metropolitan Sewerage Commission, a body especially created by the state to study out and report on this subject; and in view of the indifference of the municipality of Greater New York we respectfully request that the Department of Justice institute such proceedings as may preserve and protect the health, the commercial interest and general welfare of two of the most important states and the principal harbor of the United States." This was a letter I had written to him. "He truthfully attributes much of the intolerable condition to some of the sewers which discharge from the Borough of Brooklyn and describes in detail the said sewer. He tells you of the lack of screening and sedimentation devices. He tells you of a section 'rapidly filling with a dense population'; points out that the sewers draining this neighborhood empty not far from the mouth of Gowanus basin and adds that, 'on the flood tide the sewage cannot help being carried into that basin' (Gowanus). The purpose of this letter is to endorse and emphasize the statements made by Engineer Harrison, and to urge that immediate action on the part of the Federal Government be taken to prevent the City of Greater New York from discharging untreated sewage into the waters of New York Bay."

Q. To what sewers did that letter relate?

A. To the Gowanus sewer.

Q. To the Gowanus Canal?

A. Yes, there was talk about it in the paper and I suppose
506 that is why Mr. Harrison spoke about it.

Q. Did you communicate with the Governor of New Jersey?

A. Not on that matter because——

Q. In regard to the Passaic Valley matter?

A. Yes, I explained the situation to him, that I had written to Mr. Gibson and the matter had been ignored. I did it more to get the matter on the record than anything else. He wrote me then and told me that they had no interest in the history of that part of New Jersey.

Defendants' Counsel: I object to that and move that it be stricken out; the correspondence speaks for itself.

The Commissioner: Note the objection.

Q. But it is a fact that you communicated with Governor Fort of New Jersey in relation to the Passaic Valley Sewerage Commission and its proposed trunk sewer?

A. Yes, sir, I have the letter here.

Q. And the letter was in the nature of a protest?

A. Yes.

Q. Did the Pollution Committee of the Merchants Association confine its protests to the Passaic Valley trunk sewer or did it undertake to protest against other trunk sewers like the Bronx Valley trunk sewer?

A. We did protest against the Bronx trunk sewer and tried to get the law repealed, not because we wanted to stop the sewer but we wanted a purification plant before it was emptied into the Hudson River and we found we had to attack them at every point, which we did. We brought taxpayers' suits, tried to get the law repealed, and carried the taxpayers' suits to the Court of Appeals. We were defeated there and then we took it to the War Department and the War Department said that at the present time they didn't see why they should interfree, and then we took it to the Attorney General of the United States, and the suit is now pending, and also I
507 have induced the Leake and Watts people up there to bring suit. They are riparian owners there; and also the municipalities on the other side of the river, Inwood, Alpine, Tenafly, and two weeks ago they petitioned Governor Wilson; that was against the Bronx Sewer and its discharge at that point.

Q. Now all the investigation in re*al*tion to tests of chemists and bacteriologists by the Pollution Committee of the Merchants Association were conducted with what object in view?

A. To bring the matter before the people, to let them see that the question of pollution was very important, and of course to stop the discharge, if possible.

Q. And on what theory—that it was injurious to what?

A. Injurious to life and injurious to the navigable capacity of the harbor and a disgrace and reproach to the greatest city in this country and the adjacent cities and towns.

Q. At all the times that you have described, Mr. Hatch, were you a member of the Pollution Committee of the Merchants Association?

A. No, I conducted the matter individually on Lake Champlain up to the time, 1906, that the Pollution Committee was formed.

Q. And at your own expense?

A. Yes.

Q. And all the subsequent work done, that you have described, was done by the Pollution Committee of the Merchants Association through its chemists and bacteriologists?

A. Different chemists that we have engaged.

Q. And you have disseminated among the public in pamphlet form or book form the results from these investigations?

A. Some of them.

Q. You have just stated that your activity as an individual began some time before the formation of this Pollution Committee of the Merchants Association?

A. Yes.

Q. Do you know how that committee happened to be formed?

508 Defendants' Counsel: We respectfully object. The long examination of Mr. Hatch up to date seems to be an evidence

on the part of counsel for complainants to vindicate the Merchants Association. We have no criticism of them. We rather admire their public spirit. We suggest that it is utterly immaterial to this controversy, the activities of the Merchants Association. They have been very public spirited gentlemen, have the interests of the community at heart, but we do not think that this suit calls for their vindication, or that time or money should be devoted to their exploitation in this suit. Therefore we protest, so far as we can, against a further continuation of this evidence.

The Commissioner: Note the objection.

Complainants' Counsel: I press this line of questioning and think it was a most unhappy expression that counsel for the State of New Jersey has just used in alluding to this great civic body as being the mere exploitation of the civic body through special counsel for the State of New York. The special counsel for the State of New York desires to emphasize the independent activities of the great civic bodies of this municipality which has finally forced upon the attention of the State of New York the conditions that they do, collected data through reputable and competent scientific bodies.

Defendants' Counsel: Are you making an address?

Complainants' Counsel: And that the independent activities of these great civic bodies needs no vindication other than is emphasized by the fact that they have shown their regard for good citizenship and for the preservation of the commercial pre-
509 eminence of our great port of entry, the ideals of our citizenship, preservation of their health and the protection of their property.

Cross-examination by Defendants' Counsel:

Q. I judge from hearing your evidence that you are firmly impressed with the idea that the Hudson River, even up so far as Lake Champlain, own to and including New York Harbor, is thoroughly and altogether polluted by sewage that pours into it from all sources?

A. The Hudson River does not run to Lake Champlain. I should say at all points on the Hudson River, what is known as the Hudson River Valley. Of course where it rises, up in the head waters among these virgin forests, there is no pollution there, but when it comes down to a place where there are habitations, on the way it gets polluted and it is polluted all the way down. There are a million people up there in the Hudson Valley that contribute to it.

Q. And that is your very strong conviction with regard to New York Harbor?

A. Yes, decidedly.

Q. Being the dumping pot for all of the Greater New York?

A. Greater New York and the Hudson River Valley.

Complainants' Counsel: I have notified a number of representatives of these civic bodies and public spirited citizens that I do not desire to present any further testimony of this prefactory character, as to the conditions that were observable by laymen and people having the interests of the harbor at heart, either from commercial or

sanitary standards, and as as the rest of the testimony will be exceedingly scientific and technical, and as I find that some of my leading experts are in European countries and in remote parts of this country I will ask for an adjournment until some day early in
510 September when I can marshal my scientific matter and conserve time by presenting it in proper shape.

Defendants' Counsel: Mr. Commissioner, we quite appreciate the difficulties under which counsel is laboring, but by acquiescing, as of course we will have to, in his motion to adjourn to the month of September, we do not want to be understood as in any way giving credence to the idea that we shall expect the time limit that has been fixed by the court within which this testimony shall be taken to be overstepped. This suit we consider a very detrimental one to the interests of the project sought to be restrained, and it is very important we think that the testimony should be taken and concluded as early as possible, and we shall have to urge upon our friends upon the other side that they do complete their main testimony within the time limited by the court.

By stipulation of counsel for the respective parties the signature of witnesses was waived.

Adjourned to Tuesday, the 5th day of September, 1911, at 10:30 A. M.

511 Supreme Court of the United States, September Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Before James D. Maher, Esq., Commissioner.

299 BROADWAY, NEW YORK CITY, September 5th, 1911.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York; William A. McQuaid, Esq., Deputy Attorney General, and Dr. William J. O'Sullivan, Special Counsel for The People of the State of New York, Complainants.

Edmund Wilson, Esq., Attorney General of the State of New Jersey; Robert H. McCarter, Esq., of counsel for the State of New Jersey; Joseph Coult, Esq., and Adrian Riker, Esq., of counsel for Passaic Valley Sewerage Commission, Defendants.

512 Mr. O'Sullivan: Mr. Commissioner, the City authorities have placed a large and commodious room in the City Hall at our disposal, and I move we adjourn to that room now and continue the hearings there.

The Commissioner: That is agreeable, I assure you.

Thereupon the meeting adjourned to the City Hall.

Mr. O'Sullivan: May it please the Commissioner, at the hearings in this case in June, much testimony was put in from lay witnesses as to the conditions that were found and observable by lay witnesses in New York Harbour waters and some of the tributaries thereto. We had occasion to introduce some limited amount of testimony relative to the conditions in the New Jersey waters, notably those of the Passaic River and Newark Bay. The enterprise which the State of New York seeks to restrain is calculated to gather the sewerage from over 103 square miles of New Jersey and cities along the Passaic River. The drainage basin of this river covers 949.1 square miles, and we will show later that this river is probably the most polluted stream, certainly, on this continent. The conditions were so bad that the New Jersey Legislature started remedial measures. Beginning in 1896 an Act was passed known as Chapter 7 of the Laws of 1896 and was entitled "An Act for the consideration of a general system of sewerage disposal for the Valley of the Passaic River and the prevention of the pollution thereof". This was followed in 1897 by what is know- as chapter 35 of the Laws of the State of New Jersey for the year 1897, and was an act to prevent the willful pollution of the Passaic River and the tributaries about the Great Falls of the Passaic River at Paterson. In 1899 an act was passed as Chapter 210 of the Laws of 1899 and is entitled "An Act to prevent the pollution of the waters of this State by the establishment of a State Sewerage Commission, authorizing the creation of sewerage districts and district sewerage boards and prescribing, defining and regulating the powers and duties of such commission and such boards." This Act with some changes was subsequently re-enacted, forming Chapter 72 of the Laws of 1900.

513 Again in 1902, and Act was passed known as Chapter 48 of the Laws of 1902. This was an act creating a sewerage district which was to be called "Passaic Valley Sewerage District". Another Act was passed in 1903, and this Act dealing with somewhat the same topic was declared unconstitutional by the Jersey Court of Errors and Appeals on March 6th, 1905. Subsequently an Act was passed in 1907 known as Chapter 10 of the Laws of 1907 and is the Act under which the present commission known as the Passaic Valley Sewerage Commission, exists, and by authority of which the trunk sewer is proposed to be built which the State of New York is seeking to restrain. This Act was entitled "An act to provide for the purification of the waters of the Passaic River within the Passaic Valley Sewerage District, prohibiting the discharge of sewer of other polluting matter into said portion of the said River after a fixed date, and authorizing the municipalities lying in whole or in part within the Passaic Valley Sewerage District from the territory of which sewer or other polluting matter is or may be discharged into the said portion of said river, to enter into contract with each other and with the Passaic Valley — Commissioners for the intercepting and disposal of such sewerage and other polluting matter and to provide the necessary funds therefor."

Under that Act the Passaic Valley Sewerage Commission was au-

thorized by the State of New Jersey to construct the trunk sewer that the State of New York is seeking to restrain the construction of. That authorization was dated July 27th, 1908.

To further the enterprise that the commission was instructed to perfect, the State of New Jersey and the Passaic Valley Sewerage Commission applied to the Federal Government for a permit to tunnel under Newark Bay and New York Bay. Prior to making that application a like application was made to discharge the sewage into Newark Bay, and I will take up that matter a little later and show that the Harbor Line Board did on that application for a per-
514 mit, but the application for a permit to tunnel under Newark Bay and New York Bay were given hearings before the Harbor Line Board beginning December 9th, 1908, and the permit was granted. In applying for that permit and during these hearings much testimony was offered by the State of New Jersey, showing what they described as the terrible conditions of nuisance that obtained all along the Passaic Valley River region. Those hearings were held while the suit that you are, Mr. Commissioner, taking testimony in, was pending. The bill of Complaint was filed October 17th, 1908, and the hearing on this permit before the Harbor Line Board began December 9th, 1908. The permit was granted and subsequently in the month of January 1909, the Federal Government moved for permission to intervene in the suit instituted by the State of New York against the State of New Jersey and the Passaic Valley Sewerage Commission and the motion of intervention was granted showing that the Federal authorities for some reason were not satisfied with the conditions under which the permit was granted.

The testimony as to the New Jersey conditions which are now sought to be removed from Passaic River and Newark Bay and to create a permanent and serious nuisance in New York Bay were described by witnesses furnished by the State of New Jersey and were described upon the records at those hearings before the Harbor Line Board. The question was raised during those hearings as to whether or not the action was not in derogation of the rights of the complainants in a pending litigation. As this is under my contention, Mr. Commissioner, and is an integral part of these proceedings, I offer a copy of the testimony taken before the Harbor Line Board,
515 December 9th, and 10th in evidence, and ask that it be received in evidence and market Complainant's Exhibit No. 1.

Defendants' Counsel: We object to that as irrelevant and incompetent.

The Commissioner: It will be embodied in the testimony subject to the objection of counsel for the defendants.

Said testimony was received and marked Complainant's Exhibit Number 1 of this date.

Mr. O'Sullivan: At those hearings before the Harbor Line Board, the Passaic Valley Sewerage Commission was represented by Mr. Francis Child, Counsel for the Passaic Valley Sewerage Commission. Speaking for the commission, the lamentable conditions of the Passaic River, filth, feasible projects for the cleansing of the river, and of various items in the scheme for cleansing that river at the ex-

pense of the city and State of New York are fully set forth. The only question that was really at issue before the Harbour Line Board was the question of obstruction to navigation. This was emphasized by Mr. Child, for he stated on page 303 of that record: "I propose to discuss entirely the question of obstruction to navigation. The province of this Board, the peculiar jurisdiction of the Board is to see to it that navigation is not interfered with, either by improper construction, or in any other way." On page 306 of that record before the Harbour Line Board which I have offered in evidence, Mr. Child further said: "We are asking the privilege of constructing a sewer which we represent to you will not result in any obstruction to navigation". So that there may be no doubt about the binding character of the statements made on that occasion by Mr. Child in his representations as to what the Passaic Valley Sewerage Commission contemplated doing, he said, at page 307" "We are bound by every representation I have made as well as every matter which is
516 alleged here in this petition". As to the looseness of the scheme and the project as outlined at the time, and which to my mind has not been improved upon since, on page 308 of that record, Mr. Child said:

Mr. McCarter (interposing): Pardon me a moment, if you will: Mr. Commissioner, it is our view that this proceeding is quite irregular. This interesting recital that Dr. O'Sullivan is giving us is in the nature of an opening argument. I do not know how much control you expect to exercise over these proceedings but I do not think counsel has a right through indirection, by making a speech of opening to get on the record matters that he could not get in if he was offering testimony, and we, with great deference to Dr. O'Sullivan, strenuously object to this particular method of proceeding. I understand that the Commissioner is here to take evidence, not to listen to openings or oratory from our learned friend. We have come here to meet the evidence so far as it is offered, but we do not think there should be a stump speech or opening or resumé of what has been said before individuals, none of which is in evidence in any way or shape, and if the matter is to be persisted in, we want to have our objections noted so that at the proper time we can move to strike it out.

The Commissioner: Note the objection of counsel for the defendants and the statement of counsel for the complainants; the court will have to pass upon it.

Mr. O'Sullivan: In answer to the objection, I would like to have it appear on the record, Mr. Commissioner that we are using the statements made by the counsel who represented the defendants at the hearing before the Harbor Line Board as to the method and manner of construction and as to the nuisance that would be likely to follow if these plans and specifications as outlined loosely
517 by the commission through its representative were followed.

Mr. McCarter: Just one word of reply to that, that is, that if it is proposed to prove the plans and designs of this improvement by speeches or arguments, made by members of the commission, why, of course, it is irrelevant. The way to prove that is by

the plans and specifications themselves which are accessible and will be probably produced at anytime that is desired to show exactly what is intended to be done, and, of course, the best evidence of what is intended to be done is the specifications, not what Judge Child or somebody else said about it.

The Commissioner: Note the objection for the defendants.

Mr. Riker: If I might add a word, it strikes me we haven't had proof before us or even an offer of competent proof of just what Judge Child said, but it does not appear that the present offer of irresponsive evidence of what occurred in competent evidence, and if it is to be introduced in evidence it s-ould be offered regularly, and I therefore in behalf of the commission object to this whole line of proof if it may be so called, and shall move to strike it out on the proper occasion.

The Commissioner: Note the objection of counsel for the defendants.

Mr. O'Sullivan: I would like to say in reply to Mr. Riker that the very matters which have filled us with apprehension relative to this permanent nuisance that is about to be established in our waters, was discussed by the defendants very freely through their representative, counsel at that very hearing and even this very feature of it was taken up by him, for on page 308 he says: "Assuming these gentlemen who are so filled with fear and apprehension that it might be that their fears might be realized within a reasonable time, why, how simple it is to remove it." He says, too: "We go further than that. After we have constructed the settling basin, if it is too small, we will make it larger and we will keep on increasing the size until
518 you are satisfied." When it comes to the proposition of distribution on page 309 he says: "Now, we come to distribution. I do not know whether one pipe or five hundred pipes may or will be necessary, but if five thousand pipes are necessary we are prepared to put them there. As a member of this commission, I acknowledge the obligation imposed upon me when this application was presented to you gentlemen."

Relative to the fact or point being raised that the whole proceeding before the Harbor Line Board was in derogation of the right of the complainants, Mr. Child, answering Mr. Dean on page 310 of the record further states: Mr. Dean said he trusted that you gentlemen would delay your decision of this matter until adjudication has been had by the Supreme Court of the United States on the pending litigation between New York and New Jersey. The questions involved in the litigation are entirely foreign to any questions presented to you gentlemen. The question you are called on to determine is whether this proposed work will be an obstruction to navigation."

Commenting on the conditions that made it urgent for the application of the permit and the furtherance of the enterprise of the Passaic Valley Sewerage Commission, Mr. Child stated: "The conditions as would appear if described here is terrible and ought to be abated with reasonable celerity in this litigation. The animus of the suit between New York and New Jersey being solely the con-

struction of this sewer, that decision on your part would in no way effect this case."

Further, in relation to the point raised as to whether or not the hearings were not in derogation of the rights of the complainants, Mr. Child on page 312 set forth: "Now, it may be that at first it will appear that it would be discourteous to the United States Supreme Court to anticipate their action. Now, as against that I have this to say, that we are in the field first." That was his
519 reply to it.

Showing the grounds for our fears and apprehensions in this matter, Mr. Commissioner, and the fact that we still maintain that the hearings and the granting of this permit was under misapprehension, and that that is best borne out by the fact that the Federal Government later intervened in the suit and became one of the complainants.

As the result of this threatened nuisance and to know whether or not the harbor waters were able to digest this immense volume of sewage that would be discharged right in our own waters if this enterprise is successful, the State of New York called into being through an Act of its Legislature a body that was known as the New York Bay Pollution Commission, who were commissioned to inquire, investigate and report on the conditions of the harbor water and as to whether or not they had capacity to digest this great volume of sewage. The Chairman of that commission was Dr. Daniel Lewis, and I will now ask Dr. Lewis to take the stand.

Dr. DANIEL LEWIS, a witness on behalf of complainants, being duly sworn by the Commissioner, testifies as follows:

Direct examination by counsel for complainants:

Q. What is your full name?
A. Daniel Lewis.
Q. Where do you reside, sir?
A. I reside at Spuyten Duyvil, New York City.
Q. And what is your vocation?
A. Physician.
Q. Where did you graduate, sir?
A. I graduated from the College of Physicians and Su-geons, Columbia College, 1871.
Q. Did you have any degrees before entering on the study of medicine?
A. Degrees from college.
Q. What Sir?
A. College degrees.
Q. And what were those?
520 A. Bachelor of Arts from Alfred University in '69; Master of Arts in '72.
Q. Any other degrees?
A. Doctor of Philosophy about '86, Doctor of Laws, 1902.
Q. Were you connected in any way with the medical societies at ant time in this city?

A. Most of them.

Q. Were you president of any of the medical societies?

A. Yes. I was President of the Medical Society of the County of New York two terms.

Q. In what years, sir?

A. In '83 and '84, I think. I was fellow of the New York Academy of Medicine and have been Vice President and President of the New York State Medical Society in '89.

Q. As Fellow of the New York Academy of Medicine and Vice President of the Public Health Section of the Academy of Medicine was it?

A. Yes, Academy of Medicine.

Q. Were you actively connected with the public health section of the Academy of Medicine?

A. Yes.

Q. Have you ever contributed to the literature of your profession?

A. Yes; I have contributed a good many papers on Medical subjects, some on sanitary subjects. I read a paper before the Academy on Interstate Quarantine.

Q. Have you ever read papers or made studies of conditions relating to sewage?

A. Yes sir. I wrote a paper on the Chicago Canal—drainage canal which was published in the medical Review of Reviews; I inspected the sewage experimental station at Leeds.

Q. In England?

A. In England and also the sewage disposal plant for the City of London in Berks.

Q. Were you ever connected with our State Department of Health Board?

A. Yes; I was president of the State Board of Health for eight years until the single headed commission was appoined, then
521 I was made commissioner in charge of the department, and held the office for four years until 1904, I think.

Q. You were appointed as a commissioner of the New York Bay Pollution Commission?

A. Yes.

Q. By whom?

A. By Governor Odell.

Q. Were you chairman of that Commission?

A. President.

Q. President of the Commission.

A. President of the Commission.

Q. What year was that organized or under what Act?

A. It was organized in 1903, Chapter 539 of the Laws of 1903.

Q. 539 of the Laws of the State of New York?

A. Yes, sir.

Q. Were you familiar with the facts or conditions that led up to the establishment of the New York Bay Pollution Commission?

A. Yes.

Q. What were they, Doctor?

Defendants' Counsel: Object to that as incompetent, irrelevant and immaterial.

The Commissioner: Note the objection.

The Witness: We had heard of the proposed Passaic Sewer Construction, and after discussing the matter in the Health Department decided that it would be a menace to the public health of the State.

Q. Were these matters brought to your attention directly while you were president of the State Department of Health?

A. Commissioner of Health.

Q. Commissioner of Health?

A. Yes.

Q. They were brought to your attention in your official capacity, were they?

A. Yes. I communicated with Governor Odell regarding it recommending that some action be taken, and the Governor recommended to the Legislature the passage of a Bill establishing the New York Bay Pollution Commission to study the situation and that became a law, as I said and he appointed the commission. The commissioners appointed were Professor O. H. Landreith, who was one of the Consulting Engineers of the State Department of Health;

Mr. L. L. Tribus, connected with the Borough of Richmond;

522 Mr. Falk, a Civil Engineer in this city, and Dr. George A. Sofer, a Hygenic Engineer, five of them.

Q. When did the Commission organize for its first meeting?

A. Soon after appointment.

I have a record here that the first meeting was held on June 30th, 1903; It was then that the President,—Dr. Lewis was appointed President and Mr. Tribus, Secretary of the Commission.

Q. Well, what did the commission proceed to do after its organization?

A. They proceeded——

Defendants' Counsel (interposing): I object to that as incompetent, irrelevant and immaterial.

The Commissioner: Note the objection.

The Witness (continuing): To investigate the conditions of the harbor. They met on the Steamer R. P. Flower, made a tour of the harbor. They apportioned the work out among different members of the commission, in the study of the conditions of the water, of the tide currents of the shell fisheries in the district; they examined the water bacteriologically and chemically; they also examined the sludge at the bottom of the river and harbor in various localities. This work was carried on for about a year and a half. They also studied the amount of—investigated the amount of sewage now poured into the harbor by the sewers of New York City; they investigated the amount—the probable amount of sewage which would come into the harbor from this Passaic Valley Sewer. They were empowered to hold conferences on the Passaic Valley Sewer, which was done,—at least, two meetings—at which we went over the plans of the commission.

Q. Did the Enabling act known as Chapter 539 of the Laws of 1903, direct you as a commission to confer with any other authority from any other State?

523 Defendants' Counsel: Objected to as calling for the witness' conclusion as to what the law provided, also irrelevant and immaterial.

The Commissioner: Note the objection.

Q. I call your attention to Section 2 of that Act and ask if you followed its provisions and directions?

A. Section 2—I don't recall what section 2 is.

Q. Doctor, I hand you what purports to be a report of the New York Bay Pollution Commission to the State of New York, marked No. 39 in Senate, May 1, 1905, and ask if you know what that pamphlet that I now hand you is?

A. Yes, that is a report that we made to the Governor at the end of our investigation.

Q. How long had the commission been organized and working at the time it made that report to the State authorities?

A. About two years.

Complainants' Counsel: I offer that report in evidence.

Defendants' Counsel: I object to that as irrelevant, immaterial, purportive of nothing.

The Commissioner: Note the objection of counsel for the defendants.

Complainants' Counsel: I ask that it be marked for identification.

The Commissioner: It will be marked Complainants' Exhibit No. 2.

Q. I direct your attention, Doctor, to page 7 of Senate Document No. 39, report of the New York Bay Pollution Commission to the Honorable Frank Whalen Higgins, Governor, March 31st, 1905, and particularly direct your attention to section 2 on page 7?

A. Directing said commission to confer with the authorities of the State of New Jersey, take testimony of witnesses and make such investigations as should seem desirable to determine the
524 character of the threatened pollution of New York Bay and the means necessary to effectively prevent the same. We followed the directions of the Act so far as——

Q. (Interrupting.) Did you endeavor to seek co-operation from the New Jersey authorities in your work?

A. Yes, Sir.

Q. Did you succeed or fail in that?

A. Well, we received no co-operation, except to consent to hold two meetings. We held two conferences, one in the city of Newark and one in the city of New York, at which we discussed the plans, but that was all.

Q. What part of th- work was apportioned to you as President of the commission of the New York Bay Pollution Commission?

A. I performed the office that is usually delegated to the presiding

officer, signed vouchers for expenses and presided at meetings, accompanied the commission on its tours of inspection, and had a general oversight of the work. I was asked to write my views as to one of the plans proposed for an Interstate Metropolitan Sewage District to deal with this matter, which I did briefly, and that is embodied in this report somewhere.

Q. Was it you who allotted the different divisions of the work to be done to the various members of the commission?

A. That was done by the commission as a whole.

Q. The apportionment of the work?

A. Yes.

Q. To whom was the tidal action and river flow in the harbor of New York assigned?

A. That was given to Commissioner Falk.

Q. And to whom was the "Present Sources and Estimated Quantity of Sewage coming from different communities in and about New York" assigned?

A. I think Mr. Tribus had that, didn't he?

Q. Now, what were the other assignments?

A. Well, Professor Landreith was delegated to consider the history of the Passaic Valley Sewer Commission and their plans, and the general local aspect of the case. Dr. Sofer was given the
525 investigation of the effect of sewage on shell fisheries and made an elaborate report.

Q. And what part of the work did you take under your special perview?

A. I did not take any special work.

Q. Did the commission hold any meetings?

A. Yes, the commission held a number of meetings; I have a record of them here.

Q. Will you state what meetings the commission held?

Defendants' Counsel: Objected to as thoroughly irrelevant and immaterial.

The Commissioner: Note the objection.

Q. Go right ahead.

A. The Commission held the following formal meetings in addition to the numerous conferences between different members of the commission and so forth: Meeting of June 30th, On board the New York Board of Health steamer, "Governor R. P. Flower." Inspector of the harbor was made at that meeting, organization of the commission, assignment of technical subdivision of work to different members of the commission for special investigation. On November 30th, 1903, meeting New York City in which important matters connected with the Passaic Valley Sewerage project was discussed; authorization given for special trips to visit other sewage disposal plants. The committee of the commission went to Boston to examine the disposal plants in Boston Harbor and made a report on them.

Mr. Riker: Just what is the Doctor testifying from?

Mr. O'Sullivan: As to the work done.

Mr. Riker: From what is he testifying?

Mr. O'Sullivan: He said he had some memorandum there of the meeting.

The Witness: This memorandum is taken from the minutes; I could not recall all the dates and so——

Q. (Interposing.) What year was it, Doctor?

A. 1903.

Q. Eight years ago?

A. November 1903.

526 Q. Over eight years ago?

A. On December 22nd, 1903, we held a meeting at the office of the President of the Borough of Richmond. that was a public hearing in which we took evidence as authorized by the Act from Pilots and various people familiar with the waters of the harbor, also regarding tidal currents. At that meeting we also discussed Doctor Sofer's report of progress on the investigation of shell fisheries. Meeting on January 22nd, 1904. That was a joint session of the Passaic Valley Commission and the New York Bay Commission, and was held at 50 West 40th Street.

Q. Now, was there any discussion of the proposed Passaic Valley Sewerage project at that meeting?

A. Yes; the meeting was given up to that; full discussion of proposed Passaic Valley Sewerage project.

Q. And as a result of that meeting, was there any matter formulated and submitted?

A. Yes, there was an executive meeting, at which a number of questions were proposed to be submitted to the Passaic Valley Sewage Commission, and I suppose those questions, perhaps, are embodies in our report, somewhere; I do not recollect. On February 5th, 1904, we held a meeting at the office of the State Commissioner of Health in Albany.

Q. That was your office then?

A. Yes, and we voted to submit to the Attorney General of the State a question as to jurisdiction the State had over the waters of the Bay. There was a joint session of the Passaic Valley and the New York Bay Pollution Commission, February 12th, 1904, held in the office of the Passaid Valley Commission in Newark, in which was very thoroughly discussed the various phases of the project.

Q. There were engineers there, were there?

A. Yes the Engineer of the Commission.

Q. Mr. Harrison?

A. Mr. Harrison was there and took part in the discussion.

527 And on February 10th, 1905, there was a meeting held in New York City in which the individual reports that had been assigned concerning tidal currents, shell fisheries, and so forth, was submitted and discussed and a meeting on March 10th, held in New York City, at which we discussed the final draft of the report which was to be submitted. That comprises all of the general meetings.

Q. As a result of your meetings and of the works of the Commission, what did you do after they had submitted their reports?

Mr. McCarter: Objected to as immaterial, irrelevant and incompetent.

The Commissioner: Note the objection.

The Witness: We formulated a bill which we asked the Governor to recommend for passage to the Legislature, a bill providing for a metropolitan sewage district, with a commission appointed to have charge of the sewer outlets in the harbor.

Q. And prior to that recommendation did you make that report?

A. Yes. Well, that was embodied in our report; that was part of our report.

Q. The recommendation?

A. Yes.

Q. Was that recommendation acted upon?

A. Not by the Legislature, no.

Q. Subsequently?

A. Well, it was acted upon in this way, that the commission, a new commission was appointed—was provided for by the Legislature, called the Metropolitan Sewerage Commission, to take charge of the work and carry it along the lines which we had followed. That was embodied in a bill, became a law, signed by Governor Higgins and became a city commission instead of a state commission, New York City to pay expenses.

Q. And the New York Bay Pollution Commission separated, did it, after making its report to the Legislature?

528 A. Yes.

Mr. O'Sullivan: Your Witness.

Cross-examination by Mr. McCarter:

Q. Doctor, did the fact that the Gowanus Canal was in course of construction come before your commission?

A. Not—I do not think it did definitely; we considered the conditions of the Harbor all around here.

Q. Well, you found it was proposed by means of the Gowanus Canal, when completed, to add considerably to the present pollution of New York Bay, did you not?

A. Certainly.

Q. Did you advert to that at all in your work?

A. We notified the—at one time we sent a notification to the Borough President regarding the matter.

Q. Yes.

A. But we had authority over the——

Q. (Interposing.) Your principal object of life as you conceived it was with regard to the proposed Passaic Valley——

A. (Interrupting.) No, I do not think that is correct, Mr. McCarter; we made the same objection to the Westchester Sewer project that we did to the Passaic Valley Sewer proceeding.

Q. Westchester; was that known as the Bronx?
A. Yes.
Q. Did you object to that?
A. Oh, very decidedly.
Q. To whom?
A. To the Governor.
Q. Yes.
A. To the commission, the Bronx Valley Sewage Commission.
Q. Yes.
A. And we enlisted other int-rests to work against it also.
Q. Such as?
A. Well, such as Merchants Association.
Q. Yes, without any avail, however?
A. Well, it has finally availed.
Q. In what way?
A. Governor Dix has signed a bill requiring them to build a sewage disposal plant.
Q. What kind of work?
A. What?
529 Q. What kind of a plant?
A. Well, a plant that costs $500,000; it ought to be a very good one.
Q. I did not ask you the cost, I asked you what kind of work?
A. Well, I do not know.
Q. You do not know?
A. No. It is only about a week or ten days ago that he signed the bill.
Q. Well, you are aware of the fact that this conference that you have spoken of that took place between your commission and the so called Passaic Valley Sewage Commission was not the present commission at all?
A. The present sewerage commission?
Q. Yes.
A. No, sir, I am not aware, the commission as it existed at that time?
Q. Yes, not a commission organized under a separate law, entirely separate distinct body, you don't know that?
A. No, sir, I do not.
Q. This proposition for a Metropolitan Sewage Commission involved the idea that there should be some method of New Jersey availing itself of its interest in New York Harbor as well as New York doing it?
A. That was our idea, that there should be a district agganged in some way under the United States law or some other way, feasible way, which would control all sewage outlets.
Q. From both States?
A. Yes, sir.

Redirect examination by complainants' counsel:

Q. Doctor, you did confer—your commission did confer with the then Passaic Valley Sewerage Commissioners?

A. Yes, sir.
Q. And with a view of seeking their co-operative efforts?
A. Yes, sir.
Q. And you never received their co-operative efforts?
A. No, sir.

Q. In answering about the sewerage disposal plant pro-
530 vided for the Bronx Valley Trunk Sewer, in your answer, you have not seen the plan or specifications for the sewage disposal plant?

A. No. I have an idea that they are not ready to be inspected. The Bronx Valley Commission has fought the plan of sewage disposal from the beginning.
Q. And finally had to succumb?
A. And finally had to succumb, by being removed from office and a new commission appointed.
Q. And $500,000 I understood you to say would provide a suitable purification plant if properly applied?
A. Certainly would.

Mr. O'Sullivan: That is all.
Mr. Riker: I would like to ask a few questions if I may.

Cross-examination by Mr. Riker:

Q. Now, Dr. Lewis, you are an expert in the matter of sewage purification?
A. I cannot say that I am a practical expert; I have had a great deal to do with sewage disposal plants.
Q. Have you ever built one?
A. Well, they have been built under my direction, many of them—several of them.
Q. What do you mean exactly by under your direction?
A. When I was State Commissioner of Health all sewer plans were approved by the State Commissioner.
Q. Well, when you say that $500,000 would be adequate for a disposal plant, what kind of a disposal plant did you think that would be adequate to?
A. $500,000 I should say would provide a settling plant and a septic tank treatment which would destroy the bacteria in the sewer and make the effluent safe to be emptied in the river; I think that $500,000 would be ample.
Q. For what population do you think that would furnish a plant of that kind?
A. Oh, I can't say that.
Q. Well, you are testifying as to $500,000 being adequate for this Bronx sewer?
A. Yes.

531 Q. Now, I ask you for what population $500,000 would provide an adequate septic tank and settling basin system,—for what population it would furnish it?
A. I am not sufficiently an Engineer to answer that.

Q. Well, why did you say that $500,000 would be adequate for this particular enterprise?

A. Because I believe it.

Q. That is all, simply your unfounded belief?

A. Not unfounded, but founded on other disposal plants.

Q. Well, now, what other disposal plant is it founded on?

A. Well, the disposal plant at Saratoga, one of the best in the State.

Q. What did that cost?

A. $50,000.

Q. For how many people was that designed?

A. Designed for one hundred thousand people.

Q. And that is $50 a person, is that—well, now, how many people does the Bronx sewer serve?

A. I suppose about two hundred thousand people.

Q. Two hundred thousand?

A. I presume so, I do not know.

Q. Well, at two hundred thousand at $5 a head would make a million dollars, wouldn't it?

A. Well, that is not a fair way to figure it. A disposal plant will take care of a great deal of sewage, a good large disposal plant; I don't think you can figure it on the number of people.

Q. You don't think they are designed on the basis of population they are to serve?

A. Well, not in that way.

Q. And don't you think they cost—the cost of them is based on the population they serve?

A. Not altogether. You make a large disposal plant and it will attend to the sewage of a large district, and they all are built with the idea of supplying a larger population than the existing one, naturally. But you could not increase the cost proportionately to the increased population; that would make a very expensive sewage plant.

532

Q. Do you know whether or not the Saratoga plant is of the same character as that which has been specified for the Bronx?

A. No.

Mr. O'Sullivan: I object. This witness has not been offered as an expert; we will give you engineers and chemists and sanitary specialists later on.

The Commissioner: Note the objection.

Q. Do you know what plan had been settled for the Bronx sewer? Do you know whether any plan has been settled on for the Bronx Sewer?

A. I don't know.

Q. When you conferred with the Passaic Valley Sewerage Commissioners, — conferred with them in their official capacity, didn't you?

A. Yes.

Q. Do you know of your own knowledge what powers they had as Passaic Valley Sewerage Commissioners?

Mr. O'Sullivan: That is objected to.
The Commissioner: Note the objection.

The Witness: I assume that we knew from reading the Act establishing this commission.

Q. You conferred with them about the establishment of the Metropolitan District, did you?

A. We conferred with them regarding the effect, as we believed, on the waters of the Bay, of emptying that sewer into the Harbor.

Q. And what co-operation did you seek from them?

A. Well, we tried to convince them that it was as much to their advantage as our own to have the waters protected, was the main part of our contention that day.

Q. Well, did you happen to know whether it is within the powers that are conferred upon them by their enabling Act?

A. No.

Mr. Riker: That is all.

533 Redirect examination by Complainants' Counsel:

Q. Prior to holding your conference with the Passaic Valley Sewerage Commissioners of 1903, you had read the Act calling them into existence?

A. Certainly.

Q. And you were familiar with the powers at that time?

A. Yes.

Recross-examination by Mr. Riker:

Q. Well, if you had, did you remember that that purpose was the purification of the Passaic River?

A. The purpose was to build a sewer, trunk sewer.

Q. For the purpose of purifying the Passaic River?

A. Yes.

Q. Does septic treatment destroy bacteria in liquids?

Mr. O'Sullivan: Objected to as clearly treating the witness as an expert.

The Commissioner: Note the objection.

The Witness: Does Septic treatment destroy the bacteria in fluids?

Q. Yes.

A. Yes, to a large extent.

Mr. Riker: That is all.

Louis L. Tribus, a witness on behalf of complainants, being first duly sworn by the Commissioner, testifies as follows:

Direct examination by Mr. O'Sullivan:

Q. What is your full name?

A. Louis Lincoln Tribus.

Q. What is your profession?

A. Civil Engineer.

Q. Have you got any college degrees?

A. I graduated from New York University the year 1885 with the two degrees of Bachelor of Science and Civil Engineer; some three or four years later, I was accorded the degree of Master of Science by the same institution.

534 Q. Have you had any experience in municipal engineering?

A. I have been engaged in it continuously for the past 26 years.

Q. Have you ever filled any teaching position in any of our colleges that had engineering departments?

A. For three years I was instructor and Assistant Professor of civil engineering in the New York University.

Q. Have you held any public office in connection with your profession?

A. For three years of 1903 to 1906 inclusive, I was a member of the New York Bay Pollution Commission and New York State Commission. For the years 1902 to date, I have been in the service of New York City as Consulting Engineer and Commissioner of Public works for the Borough of Richmond, part of the time under one title and part of the time under the other.

Q. And the scope of your work embraces what, Mr. Tribus, in these capacities?

A. In connection with the New York City, the full care of the public works and of the Borough of Richmond come to my office, the design and building of sewers, making surveys and maps, the design and construction and maintainance of roads the care of erection of public buildings. In general all of the duties that come under the office of the President of the Borough, whose functions I fill at the time of his absence, the work being therefore both engineering and executive.

Q. Are you connected with any of the Engineering societies?

A. I am a member of the American Society of Civil Engineers; of the American Water Works Association; of the New England Water Works Association; of the American Society of Municipal Improvement, and various other somewhat similar organizations, though of lesser importance.

Q. Were you connected with the New York Bay Pollu-
535 tion Commission?

A. As just testified to, I was a member for the three years of its existence, and was Secretary of the Comission as well as one of the commissioners.

Q. In the organization of that Commission, were you given any special functions or office?

A. I had specially assigned to me the investigation of the then existing pollution of the harbor, peculiar from—from a sewer, garbage and other similar wastes. And in carrying out that work, I, in interview, and by communications, secured such data as were available from the different Boroughs of the City of New York and from the different communities, fronting upon the waters of the harbor on the Jersey side as well as the New York side, gathering

the data from those most available, being assisted by the Engineer and other officials in practically all of the communities and got the best they had at hand or could secure on short notice, so that the information I compiled in my special report to the Bay Pollution Commission represented, probably, the best information at that time of the different municipal authorities. The information is all compiled, and is made a special chapter or appendix in the report which you have submitted in evidence.

Q. I hand you Complainants' Exhibit No. 2 of this date and ask you what that is?

A. That is the first formal report of the New York Bay Pollution Commission as submitted to Governor Higgins on March 31st, 1905, which has covered the report of the commission as compiled by the secretary from the individual reports of the different members, and such other information as we could secure. Then follows the—as appendices, the formal reports of the different members of the commission, one on tidal and river flow, the second being my own special report, on the present sewage pollution in New York harbor.

Q. Were you Secretary of that Commission?

A. I was Secretary of the Commission.

526 Q. And as such had charge of its papers and documents and the reports submitted?

A. I had everything in my care that pertained to the work of the commission.

Q. Taking that special report of Mr. Falk, what subject was assigned to Mr. Falk?

Mr. McCarter: Objected to as incompetent and irrelevant.

The Commissioner: Note the objection.

The Witness: The tidal and flow of the river.

Q. And what was his report as handed in to you?

A. As shown in the appendix No. 1, where it appears in full. In fact I would say that in all of these appendices are practically uncorrected statements furnished by the different members of the commission. The report of the commission itself was compiled from these appendices, so as to put the matter in concise shape so that laymen might understand as well as technical men.

Q. The appendices were for the information of technical men and the general report for the laymen in the Legislative bodies?

A. That was approximately the idea.

Q. What special subject did you report on in the appendices?

A. The present sewage pollution in New York Harbor.

Q. What work did you do in collecting data prior to formulating your appendices?

A. I think I have really answered that in the earliest statement by personal interview and communication with the officials and laymen of the different Boroughs of the City and different municipalities and communities which had frontage on the waters of New York harbor, both New York and New Jersey.

Q. Were you present at any of these conferences described by Doctor Lewis with the Passaic Valley Sewerage Commissioners?

A. I was present at both conferences.

Q. What wa- the object of seeking the conference by the

537 New York Bay Pollution Commission?

Mr. McCarter: Objected to as immaterial and irrelevant.

The Commissioner: Note the objection.

The Witness: The first object was to try to find just what was proposed by the New Jersey Commission as to detail of plan. The second object which was perhaps no object afterward, to much extent, but nevertheless was there, and was well known to all parties, was to see if some joint action could not be taken by the State- of New York and New Jersey through our two commissions or through a later commission, or through some court assigned to the purpose to see if unity of action might ensue looking to a solution of the sewage problem of the Metropolitan District, irrespective of State. The New Jersey Commission showed us very early in our conference that it really had no authority to consider that phase of the question, as we were advised while the New York Commission was specially charged to look into that phase of the question. So that as a result of our conference we did nor secure much real information as to detail of plans of the New Jersey project, and found that it was then hopeless to expect the development along the broader lines due to the lack of Lagislation making it permissible.

Q. As part of the work assigned to you please state what facts you ascertained and what data, statistics and information you acquired during the preparation of that appendix?

A. If I may use my memorandum somewhat?

Q. Yes, sir.

A. Well, I found that a great majority of the sewers in New York are built on the combined system, therefore carry both the sanitary sewage and storm flow. This results or resulted in there being discharged in the harbor, not only the sanitary sewage but street detritus, which at the first run off of storms would be considerable in the aggregate.

538 From our estimate we determined that the suspended matter in the sanitary sewage alone would probably amount to some where around one thousand tons daily. Such a figure is only the result of approximate computation; no one can say absolutely what it amounts to, but that was our best judgment. We noted that the district that we called the Metropolitan District, is some of the greatest manufacturing centers of the world, and therefore the sewage had in it a great variety of matter other than that classed ordinarily as sanitary sewage, coming as we might call it from a residential district, so that the sewage problem is a very complex one and not the simple one that might be considered.

Q. And that complexity you have just now attributed to the trade waste?

A. Largely to the trade waste, which are of all quantities and conditions. Then there is some garbage, some rubbish, some ash

that reaches the sewers in spite of the best regulations and care. We found that probably a fair criterion of quantity of sewage itself was taken from the water comsumption, the amount due to evaporation in boilers and other commercial uses probably being made up by the infiltration of ground water even during the dry period of the year, so that the water supply seemed to be a fair criterion. We prepared a table bases on the report, and data furnished by these different men in the different parts of the harbor which appears in the report.

Q. Where is that table you say?

A. That appears on page 44 of the first report of the New York Bay Pollution Commission. It shows the approximate daily sanitary sewage discharged into New York Harbor. From the report of the Passaic Valley Sewerage Commission to the New Jersey Legislature for the year 1903, we noted that the sewer system being considered, would probably discharge, according to their best estimate, about three hundred and fifty million gallons of sewage in twenty-four hours when the population reached its estimated total
539 of one million six hundred thousand, the population at the time, 1904, or 1905 being estimated at about five hundred thousand, so that on the proportion of sewage the Passaic plan contemplated the pushing into the Harbor approximately of one hundred gallons of sewerage upon the completion of the work for the then immediate present.

Q. Mr. Tribus, the Borough that you are connected with, Borough of Richmond, is near the Kill von Kull, is it not?

A. It furnishes the southern border of the Kill von Kull, and th eastern border of the Staten Island is on the other Kill, the opposite shore of which is in New Jersey.

Q. Is there another large New Jersey district draining into the Kill von Kull besides this contemplated trunk sewer from Paterson?

A. Well, there is quite a large district whose sewer empties into the Kill von Kull at or near Elizabeth. That takes a considerable portion of Elizabeth and Irvington, Vailsburg, South Orange and West Orange with an estimated flow at that time of somewhere around five to eight million gallons for twenty- four hours, based on dry weather conditions. We have no exact data upon that system.

Q. Now, as the result of your investigation of the Passaic Valley sewer scheme, what conclusions did you come to relative to the result at the outfall in New York Bay?

Mr. Riker: I object to that on the ground that this man has not shown himself to be an expert as to the effect of this out fall at the point mentioned, and that his testimony is incompetent and irrelevant.

The Commissioner: Note the objection.

The Witness: The conclusion seemed to be inevitable. From the examination of sewers all along the water front of the harbor pouring in as they did, anywhere from a few hundred gallons per day to several million gallon per day, that the out-put pushing at
540 one point approximately—one point of one hundred million gallons or over would inevitably create a local nuisance that

would continue to be noticed for some distance away from the outlet point, how far, we could not definitely say, but had our opinion.

Q. From observation made by you prior to 1908, what estimate did you make as to the amount of sludge deposited in the upper Bay from Sewage?

A. As nearly as we could judge there was about—there were about one thousand tons per day coming from sanitary systems of sewage, aside from street detritus, which at storm periods is considerable in itself.

Q. Are you sufficiently familiar with sewage and sewers to know whether or not sewage brought from a distance undergoes changes in transit?

A. I am sufficiently familiar with it to state that sewage does undergo change in transit, very redical change.

Q. How would you describe the change, Mr. Tribus?

A. That the organic matters in the sewage putrify.

Q. And it is then know- as what?

A. It is known as septic sewage to use the technical term.

Q. In the course of your labors as a member of the New York Bay Pollution Commission, did you make any estimate of the approximate amount of sewage discharged now into our harbor waters, and the two rivers on each side of Manhattan?

A. Yes, and the table on page 44 to which we have referred before gives in summary our best estimate of the quantities of sewage then entering the harbor at the different points. The table itself referred to a map which accompanied the report of the commission numbers on the table corresponding to numbers on the map, the numbers on the map noting the different sewer outlets then
541 in existance around the shores of the harbor so far as we could get the information.

Q. What happens to septic sewage when it reached a body of water with a good deal of free oxygen?

A. That is a very much mooted point. The- is unquestionably a further breaking up of the sewage into elements, gaseous, liquids and solids, the gaseous passing off into the air when not further absorbed by the water, the liquid remaining for greater or lesser periods of time in suspension, the solids being held somewhat in suspension, somewhat settling to the bottom, depending entirely upon their relative specific gravities as between the solid and the carrying medium.

Q. Does septic sewage and crude sewage drain a water or extract from it much of its free oxygen?

A. It is supposed to take the free oxygen in very large quantity, and might even take from it practically all of its free oxygen.

Q. Have you had occasion at any time to examine the Passaic Valley River or the Passaic River?

A. Not in the sense of an examination of the river or its conditions, but from having seen it on many occasions at a number of different points, I am familiar with the Passaic River.

Q. Did you apprehend its condition through more than one of your sensory organs?

A. I think that to both sight and smell, its condition was very evident on each occasion of my seeing it.

Q. Well, what would you say of the oders from the river?

A. That they constituted a decided nuisance by being exceedingly offensive.

Q. Are you sufficiently familiar with the bio-chemical actions of sewage to know to what these oders were due?

A. I should rather not attempt to testify on that point.

Q. The thousand pounds of deposit or residue that you testified to, did that relate to dry weight?

542 A. That would be practically dry weight, yes; 1,000 tons.

Q. Did your commission make protest against the Bronx Valley Sewer?

Mr. McCarter: Objected to as incompetent, irrelevant and immaterial.

The Commissioner: Note the objection.

The Witness: Yes. We made vigorous protest both by formal communication to the Sewer Commission and by communications to the Governor of New York State and the State Engineer.

Q. Do you know if the continued agitation unfavorable to that Bronx Trunk Sewer scheme has eventuated in any plan of purification provided for it?

A. I assume that the continued agitation has been the cause of the recent passage of an Act requiring the interpolation of a sewer disposal plant at some point, between the reception of the sewage and its disposal—between the point of reception of the sewage and its disposal in the Hudson River. I am not familiar with the details of the law.

Q. Mr. Tribus, I understood you to say that you designed sewers and outlined schemes of sewage for municipalities?

A. That is part of my life work.

Q. Have you had occasion to have disposal plants of any kind constructed under your guidance?

A. Yes.

Q. Are you familiar with the various schemes of purification in these disposal plants as they are used in various municipalities?

A. Somewhat So.

Q. Is half a million dollars a fair measure to expend on a purification plant for a moderate size community?

A. That would depend entirely on the class of construction

543 in the locality itself. It might be an absolutely adequate sum in some places, and inadequate in others for the same population.

Q. Depending on the degree of purification of the effluent?

A. It would depend on the degree of purification and the local difficulty of construction.

Q. Have you now as an official under conpemplation studies for a scheme of sewage disposal in the Borough of Richmond?

A. To some degree, yes. We are planning and have prepared for the erection of a sewage testing station, knowing that the year in

not far distant when the sewage of the Borough of Richmond will have to go through some form of treatment, *os* that our studies are leading—are being directed to investigate with a view to final determination as to what method of treatment will be best suited for our local requirements and the conditions of the harbor, though at the immediate present, we are not designing any sewage disposal plant for that Borough.

Q. My question did not conpt-mplate designing, Mr. Tribus, it was whether you were studying a scheme of sewage disposal that might be available in the near future?

A. Only studying a general scheme. And I might add to that by saying that our sewers as built are in the system—while in general, combined systems, are so designed that we can without much additional expense take out the sanitary flow and either treat it locally or convey it to some point of better disposal. The combined flow during storm periods would go in to the harbor, that in the excess of the capacity of the sanitary channels, which, during even storm time would carry the sewage to the ultimate palce of disposition.

Q. In your Borough of Richmond have you adopted the separate or combined systems?

A. We have the combined systems in general, but the outlet
544 so arranged that the sanitary flow now goes to the p[illegible]r head line where piers are constructed, and the combined flow, or the overflow, rather, is to go at the bulkhead line,—a virtual separation of the sanitary from the storm flow.

Q. The system which you have advocated, the separate system is that in contemplation of eventually requiring such a system for a sewage disposal plant or plants?

A. That is a plan to which we are working.

Mr. O'Sullivan: That is all; your witness.

Cross-examination by Mr. McCarter:

Q. Well, you — no plan at all yet, have you?

A. There is no definite plan worked out; our work all is tending towards the later adoption of a disposal plant.

Q. Is there a single Borough in the City of New York which has a sewage disposal plant today?

A. Yes.

Q. Which one?

A. There are several disposal plants; in both Brooklyn and Queens there are several disposal plants.

Q. They are all inland taking care of the sewage that goes away from the harbor, are they not?

A. I am not entirely sure of the Brooklyn plant where that does go, whether it goes into the—first one of the bays, or whether the outlet—through a new outlet sewer that has been recently built carries it to the harbor.

Q. As a matter of fact every Borough is disposing of the Sewage that comes near to and naturally would flow into the harbor today, is it not?

A. It is doing so.

Q. And in your studies for this long time looking to some day having possibly an artificial system down at Staten Island, how much pollution did you find to exist in the harbor?

A. You mean in the harbor generally?

Q. Well, yes, we will take that first, and then down your
545 way later?

A. We found pollution evident to the sense of sight and on occasion also to the sense of smell, at many places along the shores of the harbor.

Q. Coming from the City of New York?

A. Coming from the City of New York and coming from other communities.

Q. Is that the situation today?

A. That is the situation today.

Q. Did you ever set forth a general scheme for sewage treatment of New York City's sewage?

A. Some little time ago I was called on to work out a plan for caring for some of the sewage of Manhattan bases on an idea that was presented to me and without claiming ownership of the idea or special advocacy of the plan, in my office there was prepared a plan that would — Manhattan sewage and treat it below the street level.

Q. Won't you please outline the essential features as to screens,— the size, etc.?

A. I do not recollect the detailed size of the screens, the screens were, however, more for the purpose of taking up—holding back the rougher material that would come into the sewers. The general scheme of the system was one of short time sedimentation, so to remove as much as possible in a short time the suspended matters and floating matters, the hope being that the sewer would then—the effluent of the sewage would then pass into the harbor still in a fairly fresh condition and sludge to be treated either by some method of local action thro-gh pressers and dryers or through being pumped to sludge tank steamers for final disposition in the ocean.

Q. Well, if was your belief, when your office, as you say belched forth this plan that it would be satisfactory, wasn't it?

A. I claim no special advocacy of the plan.

Q. You believed, however, that it would be satisfactory?
546 A. I believed that the plant would work and would produce the results that it was plan-ed for.

Q. You recommended it, did you not?

A. Not specially.

Q. Well, you recommended it?

A. Not specially, I presented it.

Q. Pardon me?

A. I presented it.

Q. Presented it?

A. As being the working out of an idea which I was asked to work out.

Q. Exactly. And it presenting it to the city and recommending

it, without special recommendation, you believe that it would prove fairly satisfactory, didn't you?

A. I must disclaim recommending it; it was recommended by the Chairman of the Pollution Committee of the Merchants' Association.

Q. Well did you believe that it would prove fairly satisfactory?

A. That it would be satisfactory so far as it was planned to do certain work.

Q. Well, was that a desirable work?

A. An excellent work.

Q. Have you ever compared that scheme such as you have described with the plan of the Passaic Valley Sewerage Commission which this suit is sought to enjoin?

A. I did.

Q. How did they differ?

A. I do not feel like analyzing the details of the plan of the New Jersey project, but there is some similarity in the plan,—a general similarity.

Q. Yes. Well, you said, Mr. Tribus,—you have not answered my question; I asked you how they differed?

A. I can scarcely answer that question without going into a close examination of the Jersey plans and a close examination of the other plan and pick them out point by point.

Q. But in the main they were not, in your view, very dissimilar?

A. They were quite similar.

Q. And the one would probably be as satisfactory as the other?

A. Just about.

547 Q. How long ago was it that you presented this plan to the city?

A. I do not recall the precise date, but I should say that it was about three years ago.

Q. Where did you get the impression that the project of the Passaic Valley Sewerage Commission was to discharge three hundred and fifty million gallons daily into the harbor?

A. I do not recall at the moment whether that came from the report of the commission, one of the public reports, but that is my recollection, or whether it came out in the conferences with their —the formal conferences with the commission or in other personal conferences with Mr. Harrison, or others representing the commission.

Q. Well, don't you know that that is the maximum discharge,—ultimate maximum discharge and not the average, or rather, don't you know that that is the estimated maximum momentary rate rather than the daily discharge?

Mr. O'Sullivan: Object to that question as very indefinite, Mr. McCarter.

The Commissioner: Note the objection.

Q. Don't you know that?

The question was read by the stenographer.

Mr. O'Sullivan: I object to that question on the ground of indefiniteness.

The Witness: I was under the impression that that represented the estimated maximum discharge when the district had reached its ultimate population and the sewer system was working at its full *economy*, rather than the rate for any given moment during the operation of the sewer. The rate during any given moment might be many times that on occasion.

Q. Then you don't seem to understand that the three hundred and fifty million gallons is either the normal or the maximum expected daily flow?

548 A. I did understand that three hundred and fifty million gallons was the anticipated daily flow when the district reached its full population and the sewer was doing its full work.

Q. How much study have you given to the scheme of New Jersey?

A. I can't answer as to the number of days or hours, but a considerable study to the scheme during the past eight years.

Q. Well, do you believe yourself to be familiar with the plant?

A. Reasonably familiar.

Q. In this report that you speak of to the State Commission, you did not make any determination of the amount of oxygen, did you, in the Bay?

A. I did not.

Q. Did anybody?

A. The Oxygen question was, I think taken up somewhat by one of our members, Dr. Sofer, and I am under the impression it was taken up a little in the report of Mr. Falk, although of that I am not sure.

Q. At any rate you did not consider it?

A. No.

Q. And you do not yourself pretend to be a chemist of sufficient proficiency to undertake to pass upon these subjects?

A. I do not.

Q. Your work was more quantitive as to sewage pollution?

A. Yes.

Q. Do you think that pollution can be studied intelligently and adequately, Mr. Tribue, withour considering the oxygen question?

A. I think that that is a very important factor.

At 1 P. M. the commissioner declared a recess until 2 P. M.

549 CITY HALL, NEW YORK, September 5th, 1911.

The commission after recess re-convened at 2:05 P. M.

Mr. McCarter: Mr. Commissioner, it has been suggested in view of certain propositions that have been made looking to an adjustment of this suit, that the further continuance of this examination be deferred one week in order to give all parties time to get together and endeavor to agree upon certain matters which involve some of the scientific questions, and if it is agreeable to the commissioner, it is agreeable to counsel on both sides that we take that course.

The Commissioner: Suppose we adjourn until next Monday morning at 10:30 A. M. in this room.

Mr. McCarter: Very good, sir.

The Commissioner: The hearing stands adjourned until next Monday, September 11th, 1911, at 10:30 A. M.

550 Supreme Court of the United States, September Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK, September 11th, 1911.

Before James D. Maher, Esq., Commissioner.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York; William A. McQuaid, Esq., Deputy Attorney General, and Dr. William J. O'Sullivan, Special Counsel for the People of the State of New York, Complainants.

Edmund Wilson, Esq., Attorney General of the State of New Jersey; Robert H. McCarter, Esq., of counsel for the State of
551 New Jersey; Joseph Coult, Esq., and Adrian Riker, Esq., of counsel for the Passaic Valley Sewerage Commission, Defendants.

Mr. McCarter: Mr. Commissioner, with your permission both sides have agreed that it will be beneficial under existing circumstances to ask a further continuance of this matter until next Monday morning.

The Commissioner: Perfectly agreeable to the Commissioner. It will be understood that we adjourn to meet in this room next Monday morning at 10:30 A. M.

Adjourned to September 18th, 1911, at 10:30 A. M.

552 Supreme Court of the United States, September Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK,
September 18th, 1911—10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York; William A. McQuaid, Esq., Deputy Attorney General, and

Dr. William J. O'Sullivan, Special Counsel for The People of the State of New York, Complainants.

Edmund Wilson, Esq., Attorney General of the State of New Jersey; Robert H. McCarter, Esq., of counsel for the State of New Jersey; Joseph Coult, Esq., and Adrian Riker, Esq., of coun-
553 sol *of* the Passaic Valley Sewerage Commission, Defendants.

Mr. Riker: Doctor, I would like to ask your last witness a few questions in behalf of the commission.

Mr. O'Sullivan: Yes, sir.

LOUIS L. TRIBUS, a witness in behalf of complainants recalled, testified as follows:

Cross-examination by Mr. Riker:

Q. Your profession is that of a Civil Engineer is it not, Mr. Tribus?

A. Yes, sir.

Q. And you have had a good deal of connection with municipal work?

A. A good many years.

Q. How long have you been engineer for Richmond Borough?

A. From early in 1902 to date.

Q. Continuously?

A. Continuously.

Q. And when did you become a member of the New York Bay Pollution Commission?

A. At its inception, in——

Q. (Interrupting.) 1903, was that?

A. In 1903, that was the date of organization.

Q. And is that body still in existence as a body?

A. It is not.

Q. When did it go out of existence?

A. It went out at the close of—I think it was a three year life.

Q. I beg pardon?

A. At the close of a three year life; in 1906, I believe it
554 was.

Q. That would be about 1906?

A. 1906.

Q. And were you building any sewers on Staten Island during that period?

A. Yes.

Q. You were in charge of the construction work?

A. Yes.

Q. Did they provide for any treatment of any kind of sewage before it was discharged into the Bay?

A. No immediate treatment.

Q. And since 1906 you have built sewers for the Borough of Richmond?

A. Continuously.

Q. And they all discharged into the waters of New York Bay without any treatment?

A. They do.

Q. What point, as to depth, do they discharge, as a rule? What is the maximum depth below the surface of New York Bay of any of these sewers?

A. I cannot give you precise depth: they discharge at approximately low water mark; in some instances, a little below low water mark, and where there is a dock or where we meet building or structures that interfere with navigation the discharge pipe of the sanitary flow or the dry weather flow is approximately the pier head line.

Q. About at low water mark?

A. About at low water mark or a little under. The storm flow or combined flow is carried to the farthest out point as far as the capacity of its pipe would go, and the balance would be discharged at the bulkhead.

Q. Yes. When you say a little below low water mark, can you give me a limit?

A. One or two feet.

Q. Not to exceed two feet?

A. I think in no instance exceeding two feet.

Q. In that separation of the Storm water and the sanitary flow, do you mean that you had two separate systems of pipe?

A. No, I mean that the inceptor and the channel that conveys the sanitary flow out to the limit of the outlet is large enough to carry all of the sanitary flow and the first rush of the
555 storm flow, then the section of the channel enlarges so as to take the balance of the flow and debouches it at the bulkhead.

Q. And that is diverted at the point of the smaller sanitary flow?

A. Practically diverted.

Q. And it is simply a question of overflow or surcharging the capacity of the pipes called the sanitary flow which accompanies the storm water out?

A. That is a description.

Q. And that is the only provision that you have made looking toward any future treatment of the crude sewage of Richmond Borough, isn't it?

A. That is the only feature carried out providing for the future treatment.

Q. Well, when I said made, I meant carried out. And since your connection with the pollution body, you have been going right along designing and building that type of sewer?

A. I have.

Q. Now, what is the proportion of capacity that you allot in a pipe sewer to what you term the sanitary flow as compared with the storm flow combined?

A. That is a very difficult question to answer in figures. The general capacity that we provide for, for the sanitary flow is on the basis of about 100 gallons per capita per day of population, likely to

be within the district served by the particular sewer system. The storm flow is provided, not for the maximum storm that occurs once at long intervals, but for the ordinary storm periods of seven to ten years, so that until a district was built up beyond its estimated capacity the sanitary capacity of the sewer or the capacity of the sewer for sanitary flow would take the first and filthy rush of the storm flow. As to actual proportion, that is simply, the proportion beyond, we will say, the 100 gallons per capita and whatever may be the rate of rain fall.

556 Q. What in your practice in this vicinity and in the Borough of Richmond, what additional capacity do you build your pipes to accommodate in a combined sewer above the amount that you calculate for sanitary flow?

A. It is almost impossible to put that in percentage because our custom varies according to different localities served.

Q. Well, what would be the minimum?

Mr. O'Sullivan: One moment; let him answer.

The Witness: Continuing.) The storm flow in some cases would provide—the capacity for storm flow in some cases would have to take practically all of the rain fall for any ordinary storm, the run off being verp rapid; in other districts, it would take off only a portion, because the district would be less built up and the water would reach the sewer more slowly, and it is hard to say just what proportion there would be as to quantity without going actually to my figures and findings what amount of rainfall it is provided for. In general, I think it would be in the neighborhood of two inches per hour as a maximum for which the sewers would provide.

Q. Can you give me a minimum figure of the size of that combined pipe?

A. No, I cannot do that.

Q. You cannot do that?

A. They vary so. We have them down to 12 inches in diameter and we have them up to an equivalent circle of over 10 feet in diameter.

Q. Well, now, take the one that is ten feet in diameter, how much of that have you estimated for the sanitary flow?

A. If I remember correctly the sanitary discharge pipe for that is three feet in diameter.

Q. Then, in that case, it is three to ten?

A. Well, as to diameter, yes, but not as to capacity.

557 Q. Well then there is a larger capacity in the larger size, isn't there? There is less hydraulic friction in the larger size, isn't there?

A. Oh, yes.

Q. So that the larger size will discharge relatively more than the smaller size?

A. It is very nearly as 9 to 100.

Q. 9 to 100?

A. Approximately.

Q. So that in that case you are estimating to provide for ten times the amount of sanitary flow in that sewer?

A. No, I am providing for ten times the amount of storm flow to sanitary flow.

Q. The size of the sewer is ten times too large for the amount of estimated sanitary flow?

A. Approximately.

Q. In dealings as a member of the Pollution Commission with the discharge of polluting matter into the New York Harbor, you disregarded the storm water flow entirely, didn't you?

A. Very largely so, not entirely.

Q. Well, isn't it a fact that in your report you have disclaimed dealing with the storm flow as being so intermittent in amount as to practically be negligible in dealings with the whole problem?

A. As a factor in that particular problem the storm flow as a whole is practically negligible.

Q. Now, in building a sewer for combined storm water and sanitary flow, you design it for a maximum, do you not?

A. We design it for the maximum storm that we believe to be economical to provide for, not the maximum rain fall that might occur.

Q. And if you had designed a sewer with a maximum capacity of 350,000 gallons a day of combined flow, you mean that as a maximum of the probable charging of that sewer don't you?

A. Yes.

Q. And what would you say as to the amount of sanitary sewage that would be probably included in that maximum flow of
558 350,000 gallons a day, it being a combined sewer?

A. The percentage would vary entirely with the kind of locality served, whether it was the condition of development as in lower Manhattan, almost throughout Manhattan, or whether it was the condition of development as in the more residential districts of Richmond. There is a great variation.

Q. Well, we will assume it is intended to serve a manufacturing city like the City of Newark, and the City of Paterson and the City of East Newark or Harrison, that type of community?

A. Yes. The percentage of sanitary flow in those localities during storm periods would be less, relatively, to the storm water, than in the Borough of Manhattan, here.

Q. Yes. So that a sewer designed for a maximum capacity of 350,000 gallons of combined flow, would in your opinion, not discharge a maximum at any time of sanitary flow, within thirty-five millions a day, would it?

A. I would not want to make any estimate as to proportion without being specific as to a locality and being able to figure for a locality.

Q. Do you think it fair to say that a sewer that was designed for the Passaic Valley Sewer Commissioners with a capacity maximum of three hundred and fifty million gallons of sewage is likely to pour three hundred and fifty million gallons of sewage per day into New York Harbor?

A. My supposition from the very start has been that the figures on, say, three hundred and fifty million gallons were intended to represent the sanitary flow and manufacturing wastes, which amount to the same thing in a sense, that would come into that sewer system regardless of storm flow.

Q. That was the assumption?

A. That was the assumption.

559 Q. How many of population on the basis you have already estimated would a three hundred and fifty million gallon daily flow of sanitary waste represent?

A. On the basis of our Staten Island proportion of population, it would represent three and one half million people, but our Staten Island proportion is not a proportion that would apply to a City built up with ten, twelve or twenty story structures.

Q. Do you know how many in population the Passaic Valley Sewerage District includes?

A. I only have that from your report, and I do not recall the precise figure.

Q. Do you know the amount of population it includes?

A. Only by the report. I would rather not quote that without having the figures before me.

Q. And you still think that statement of three hundred and fifty million gallons as the likely dicharge of this sewer in to New York Bay is a fair statement, do you?

A. I have no knowledge as to that other than reported by the Passaic Valley Commission.

Q. Now, Mr. Tribus, what is the present sewage discharge if you have estimated it and calculated it, in any way of the Passaic and Hackensack Rivers through Newark Bay in the Harbor of New York?

A. I have made no personal estimate of the quantities.

Q. Why didn't you?

A. Because I assumed that the data given by the Passaic Valley Commission was reliable and therefore I have taken them.

Q. Mr. Tribus, in your table that you prepared, you took figures furnished by different municipalities, didn't you?

A. In my summary as given in this paper.

Q. Well, then, why didn't you state it in this table as given you by the Passaic Valley Sewerage Commissioners?

560 A. Did I not do so?

Q. I don't think you did; I don't think you put it in your table; you have given a reference to it in your reading matter but not in the table?

A. I may not have thought at the time of preparing that table that it was essential to include other than the sewage that came into the harbor directly, and if I remember correctly, that is the purport of the table.

Q. Well, this sewage matter is discharged into New York Harbor, isn't it?

A. Not as raw sewage, as treated sewage, yes, treated by Nature in the great settling, and you might say purification basin of Newark Bay.

Q. And have you investigated in any way the quantity and character of that treated sewage as it comes out of this natural septic basin of Newark Bay into New York harbor?

A. Not from a personal chemical or biological examination.

Q. And you have not attempted to estimate the amount in quantities, have you?

A. I have taken the statements there for that of the Passaic Valley Commission and its engineers.

Q. That is, as you understand it, is it not, the total discharge at the present time of sewage, both sanitary and storm water of the proposed Passaic Valley Sewerage Commission District?

A. Unquestionably.

Q. And in so far as it is not purified by the great natural septic basin of which you have spoken, it reaches New York Bay in as bad or worse condition, than it would as if it were discharged directly into the Bay of New York, does it not?

A. No, I cannot confirm such a statement.

Q. Does not the sewage undergo chemical changes in the development of bacteriological germs of one sort and another when it lies undigested?

A. Provided it lays undigested, yes, but to a very large
561 extent it is digested within the limits of Newark Bay.

Q. How do you know that?

A. From the fact at the present day, there is very little, if any, condition of nuisance in the kills, due to the flow from Newark Bay. What the chemical analyses of biological or bacteriological analyses of the water might show I am not prepared to testify.

Q. And still in reporting on this matter to the Governor of this State or Legislature, you have put it into your Appendix that the discharge of this same sewer at a point in New York Harbor, and at a depth of 70 feet, in your opinion is likely to produce dangerous conditions in the immediate neighborhood?

A. I certainly should have put it in that report, as I should put it in any report today written on the same subject, as it would tend towards converting New York Bay into a great septic basin like—into a great sedimentation basin, as is Newark Bay today. The greater quantity of water would tend, of course, to lessen the degree of nuisance, but I do not think it would prevent it.

Q. Do you know the cubical contents of the Bay of Newark?

A. I do not.

Q. And you call that a septic basin?

A. I intended to correct that; I call it sedimentation basin.

Q. Well, is sanitary sewage susceptible of a great amount of sedimentation in a bay of the character of Newark Bay where there is a continuous flow of water?

A. I think so.

Q. And immediately adjoining that great sedimentation basin in the Kill von Kull and the Arthur Kill, you don't discern any effects from the sewage that is poured into that sedimentation basin, do I understand you to say?

A. I have seen practically no instance, and have heard of

practically none, where any nuisance existed or exists in the Kills due to the flow from Newark Bay, although I have no doubt whatever that an analyses of the water will show the sewage in-
562 fluence very largely.

Q. But these influences as far as you have observed are not *precepitable* to the senses, are they?

A. That is a correct statement.

Q. How wide is the Arthur Kill?

A. About half a mile, I think, at its greatest width.

Q. Well, at the point it enters Newark Bay, how wide is it?

A. Well, it widens out there into really two portions, partially—in two portions, Shooters Island separating the Kill into these two channel waters, and there is a little greater width at that point there, if it can be called Newark Bay of the Kill, I do not know.

Q. Well, between Shooters Island and the shore, what is the width approximately?

A. Shooters Island—there isn't over five or six hundred feet between Shooters Island and Staten Island.

Q. And how far is Jersey from Shooters Island?

A. On the other side it might be a point approximately half a mile there.

Q. And how wide is the Kill von Kull?

A. I should say the Kill von Kull, I think, is about half a mile in its greatest normal width, there is a little—possibly a little greater in some places than in others.

Q. Now, Mr. Tribus, in this sedimentation basin, natural, or Newark Bay, don't you understand that all the storm water flow is being sedimented there?

A. Certainly.

Q. Have you familiarized yourself with the present details of the plant of the Passaic Valley Sewerage Commissioners?

A. I have not seen the latest detailed plans.

563 Q. If they included a sedimentation system will the effluent in your judgment be any more objectionable than the effluent that comes off Newark Bay?

A. If they include an adequate sedimentation system the effluent would be no worse.

Q. And the effect of that effluent even if po-red out on the surface of New York Bay, would not be likely, in your judgment to be any more injurious than the effluent from the natural sedimentation basin of Newark Bay and the Kill von Kull and the Arthur Kill, would it?

A. I would not go quite as far as saying that, unless the sedimentation treatment of the sewage was fully as adequate as is the sedimentary action and other actions that go on in Newark Bay, for there are other types of sewage purification carried on in that Bay than those that would obtain in simply a sedimentation system, no matter how adequate.

Q. I understand you that you do not know what the State of New Jersey of the Commissioners, rather, have agreed to do so far as the United States Government is concerned?

A. I have seen what purports to be a copy of the agreement.

Q. And assuming that that agreement is carried out as to sedimentation, do you think that it is proper to say that this plan contemplates turning New York Harbor into a sedimentation basin?

A. If the plan of the Passaic Commission produce the different results that are stated will be created by that agreement, or by the plans in that agreement, I have nothing further to say against the plans of the Passaic authorities.

Mr. Riker: That is all.

Redirect examination by Mr. O'Sullivan:

Q. Mr. Riker asked you, Mr. Tribus, what size population would discharge an amount of sanitary sewage equal to three hundred and fifty million gallons a day, and as I got your answer it was three and a half million people?

A. Three and one half million people.

564 Q. Did you intend to be understood that that would be the amount of sewage per capita that would aggregate three hundred and fifty millions of gallons daily for three and one half millions of people?

A. That is on the basis that we have used in Staten Island for our sewage, for that class of development, about one hundred gallons per capita per day for sanitary flow. It would be greater than that in a district like the lower part of New York and it might be decidedly greater than that in a district like Newark, including the manufacturing wastes which would have to go into the sewage and would be included in the sanitary flow.

Q. What unit do they accept or estimate in making calculations for Newark as to per capita sewage?

A. I do not recall the amount, but I think it is far in excess of the one hundred gallon rate, which we take as governing practically a residential district.

Q. And your answer was predicated upon the assumption that you are accepting a computation for a residential section?

—. Yes, sir.

Q. Do you know what the unit of calculation for New York City is?

A. If I remember correctly the water consumption of the City is very nearly one hundred and forty gallons per capita per day, which is added to somewhat by the amount of water secured in various buildings through driven wells and through some rain water tanks, and somewhat lessened by that which passes off in the shape of steam and is otherwise used in manufacturing probably 140 gallons is a fair figure.

Q. And in your answer to Mr. Riker, you based that answer, did you, on a residential region?

A. I based it entirely—I was being asked as to the Richmond Borough or Staten Island conditions, and I based the esti-

565 mate therefore on the same conditions that we were showing there and had to meet.

Q. Do you know that the conditions are different along the line mapped out for the Passaic Valley Sewer than those obtained in Richmond?

A. I am aware that they are very decidedly different.

Q. That it is a large manufacturing region?

A. Yes; therefore the percentage of sanitary sewage would be considerable greater than in a residential district.

Q. And in your answer to Mr. Riker, did you take into calculation the trade or industrial wastes?

A. I included that in speaking of the manufacturing conditions, the trade wastes that would go into the sewage inevitably, although not always intentionally.

Mr. O'Sullivan: That is all.

Recross-examination by Mr. Riker:

Q. Do you understand that the sewer designed by the Commissioners is a combined storm water and sanitary flow sewer?

A. I have understood that it was practically a sanitary system that the storm flow from the different communities would pass into the streams very much as they do at present.

Q. Any your comments on this plan, therefore, are all based on that assumption?

A. Not necessarily, for the adding of storm waters to the sewage, would simply mean a small additional dilution, but negligible so far as the quantity of water either in Newark Bay or New York Bay would be concerned.

Q. But it has some reference assuming that the storm water flow discharges through this sewer as to the capacity designed for sanitary sewage, wouldn't it?

A. Oh, yes.

Mr. Riker: That is all.

566 Redirect examination by Mr. O'Sullivan:

Q. Mr. Tribus, will you make plain the distinction in your mind as to the sanitary and other systems, as to their relative differences; what you mean when you use these terms, so as to get that on the record?

A. A sanitary system means a system planned to take the normal house wastes and such manufacturing wast-s as can be admitted properly to the sewers without taking in any waters from the streets or streams. The combined system means, of course, taking in addition to the house and manufacturing sewage certain quantities that may be planned for, of the rain fall as it reaches the public street and through proper catch basins reaches the sewer. The combined systems on which I have been cross examined for Richmond particularly, and in many places also provide for such channel ways in the inceptors and at the outlets, that all of the normal dry weather flow or sanitary flow, shall be carried in such channel ways and in many instances, the first rush, also, of the storm water flow, which

takes the filthy wash from the streets, so that after that there is a mixed sewage unquestionably, but the foulest matter has passed off and the storm flow being usually of a short duration does not seriously affect the system.

Q. Are you familiar with the manufacturing regions along the Passaic River, Mr. Tribus?

A. Somewhat so.

Q. Do you know whether or not it is a fact that a large amount of the water used in those steam manufacturing plants is or is not drawn from the river?

A. I have no knowledge as to where that water comes from, but I would suppose that in some cases the water from the river was too foul to use in the plants unless taken through expensively operated filters.

Q. In the three hundred and fifty million gallons of sewage in this estimate, approximately what percentage of that
567 would be solids?

A. I had rather refer to the commission's own report than try to give an estimate of that quantity.

Q. Is it or is it not a very small part of that volume of sewage?

A. It is a very small part of the whole.

Q. You are familiar with Newark Bay and Passaic River are you?

A. I am.

Q. Would the divertion of three hundred and fifty million gallons of fluid from that water shed interfere with the navigability of Newark Bay and Passaic River?

Mr. Riker: I object on the ground it is not at issue in this case, and the question and answer are irr*el*vant.

The Commissioner: Note the objection.

The Witness: I should say that it would have very little effect, unless at a very low stage of the river, and only in the upper region where the quantity of sewage would be the least, so the amount of diversion the least.

Mr. Riker: May I ask one more question?

Mr. O'Sullivan: Yes.

Recross-examination by Mr. Riker:

Q. In designing a sewer for combined flow, what fractional part of the maximum is estimated as the minimum of that sewer, or don't you estimate it?

A. We don't estimate it that way.

Q. Well, do you estimate an average flow?

A. Yes, we estimate an average flow as far as the sanitary flow is concerned. We estimate a reasonable maximum, and I emphasize the reasonable, for the storm flow.

Q. You have answered that, I think, by illustration of that 10 foot sewer and you said three feet was the sanitary plan and the balance to provide for the storm flow.

A. Yes.

Mr. Riker: That is all.
568 Mr. O'Sullivan: That is all Mr. Tribus.

Dr. GEORGE ALBERT SOPER, a witness in behalf of complainants, being duly sworn by the Commissioner, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. What is your full name?
A. George Albert Soper.
Q. Where do you reside, sir?
A. New York City.
Q. Have you studied at any of our institutions?
A. Yes, sir, I have.
Q. Taken any degrees?
A. Yes.
Q. What degrees, Doctor?
A. Degree of Bachelor of Science at the Rensselaer Polytechnic Institute, Troy, New York and the degrees of Master of Arts and Doctor of Philosophy at Columbia University.
Q. Any other degrees, Doctor?
A. No others.
Q. Were you connected with the New York Bay Pollution Commission, Doctor?
A. Yes, throughout its existance..
Q. How were you appointed on that commission?
A. Appointed by the Governor.
Q. What Governor?
A. Governor Odell.
Q. In what year?
A. In 1903.
Q. How long did you serve on the New York Bay Pollution Commission, Doctor?
A. Throughout its existence, three years, I think.
Q. Did the commission make a report?
A. Made two reports.
Q. When was the first report made, Doctor?
A. March 31st, 1905.
Q. And when was the second report made?
A. The following year.
569 Q. Who was chairman of that Commission?
A. Daniel Lewis.
Q. What portion of the work was set for you to do, Doctor, in relation to that commission's activities?
A. Special report on the sanitary and bacteriological conditions, fisheries, and industries affected by pollution in New York Harbor.
Q. Now, Doctor, will you describe what you did and such facts as you gathered in the allot-ed work set for you by the New York Bay Pollution Commission, and what report you made thereon?
A. I made a report which is entitled "Appendix III to the Report of the New York Bay Pollution Commission to Governor Higgins, dated March 31, 1905." The work involved in making that

report consisted of studies of the chemical and bacter-ological conditions of the harbor waters and statistical studies of the number of persons and industries closely connected with the Harbor and the digesting of the data resulting from the analyses of samples of the waters and of shell fish, and studies of the effects of tides and currents, and other purifying agencies. Attention was given in that report to the project of the Passaic Valley Sewerage Commission as announced at that time and a summary of thirty conclusions was appended to the report.

In the analyses of the waters and shell fish, samples were taken through upper New York Bay, through the Narrows in the lower Bay. They were analyzed by standard procedure and the tabulated results of the examinations were combined to form tables which are printed in the special report which I made to the Pollution Commission.

Q. What methods did you employ during your analyses?

A. The methods of examination were for the most part those of the Committee on standard Methods of water analyses of the American Public Health Association. The examinations were made at the Mount Prospect Laboratory of the Department of Water Supply, Gas and Electricity. There was some examination of shell fish made at the Bender Hygienic Lab-ratory at Albany, in order to see whether a check could be found upon the work being done in New York. The samples of water were put through the usual sanitary examination, with, I think, a few items of the examination excepted. The samples, that is as far as chemical analyses were concerned, there were some bacter-ological analyses made to determine the number of bacteria present in the water and the frequency with which the colon bacillus was found. The bacter-ological as well as the chemical work was done at the Mt. Prospect Lab-ratory and under the personal supervision of Daniel D. Jackson, Director.

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Q. And at what point were the water samples taken, Doctor?

A. The water samples were taken at points indicated upon the charts which accompany the two reports of the Pollution Commission. Did you wish me to specify them?

Q. Yes, sir.

Mr. Riker: Well, before he goes into it, I think it ought to appear that this is going to be offered, so as to show it.

Mr. O'Sullivan: What he is using now has been offered and marked in evidence, Mr. Riker. That is the first report of the New York Bay Pollution Commission. The second report has not been offered.

Mr. Riker: I think it has. I think, however, I am entitled to examine him on the special use of this, as——

Mr. O'Sullivan (interposing): All right.

Cross-examination by Mr. Riker:

Q. Did you take these samples yourself?

A. I did not.

Mr. Riker: I object to his using the chart.

By Mr. O'Sullivan:

580 Q. Were they made under your direction?
A. Yes, they were.
Mr. Riker: Were you present when they were made?
The Witness: I was not.

Mr. Riker: I object to it.
The Commissioner: Note the objection.

Direct examination (resumed).

By Mr. O'Sullivan:

Q. Who made the collection of samples?
A. The samples were made under these circumstances: first,—as I indicated a moment ago, Daniel D. Jackson had charge of the analyses; he had charge of the collection. He and I planned definitely where the samples were to be taken and I told him when they were to be taken, and how they were to be taken and he reported upon the taking of the samples, and upon the results of the analyses.
Q. Was all of that done under your direction?
A. All done under my direction.

Mr. O'Sullivan: I press my right to use it.
Mr. Riker: Just one other question.

Cross-examination by Mr. Riker:

Q. Under your direction. Do you mean that you were personally supervising the taking of these samples?
A. In the way in which I just described.
Q. And in no other?
A. I should not say that.
Q. Well, in what other?
A. I was not present when they were taken.

Mr. Riker: Yes. Well, I press my objection.
The Commissioner: Note the objection.

Direct examination (resumed).

By Mr. O'Sullivan:

Q. Go ahead, Doctor.
A. Do you wish all the points indicated where the samples
581 were taken?
Q. Yes.
A. The first sample was taken a few hundred feet south of Pier A. North River. The second sample was taken——
Q. Is that indicated on that map?
A. The location of the sampling is all indicated on the map. The number of the samples taken is indicated also, there being forty-five of these.
Q. What map are you referring to now, Doctor?
A. I am referring to the map which accompanied the first report

of the New York Bay Pollution Commission. The numbers of the places the samples were taken are indicated in squares.

Q. Will you read the title of that map?

A. The title of that map is "Outline Map of New York Harbor and Vicinity showing main tidal flow, sewer outlets, shell fish beds and analyses points" accompanying report of the New York Bay Pollution Commission, 1905, signed by the Commissioners.

Q. Now, will you proceed to describe, Doctor, where the samples were taken?

A. The second sample was taken in the main ship channel of the Upper Bay, between Black Tom and Gowanus.

Q. Is that sample indicated on the map by any special figure or number or indication of any kind?

A. The number of the sample id indicated in a square above the letter R in Upper Bay. The third sample indicated by the figure 3 enclosed within a square was taken in Upper New York Bay between Tompkinsville and about 69th Street, Brooklyn. Sample 4 indicated by the figure enclosed within a square, taken at the Narrows.

Q. What figure?

A. 4. The next sample indicated by the figure 5 enclosed in a square was taken below the Narrows near Gravesend Bay. The next sample indicated by the figure 6 in a square, was taken in Lower Bay, near Nortons point, Coney Island. The next
582 sample indicated by the figure 7 in a square was taken in the Lower Bay near the Iron Pier, Coney Island. A series of samples—that was one series taken on one day. It follows the Main ship canal as far as a point below the Narrows and then runs along the Coney Island Shore at a distance from the Shore such as steamboats ordinarily take.

Another series of analyses made from samples refers to the water in the neighborhood of the Staten Island Shore, beginning at Tompkinsville and running south and east. The series begins with a figure 8 enclosed within a square at Tompkinsville; 9 is just south of it; 10 is further south at Stapleton.

Q. Doctor, so as to get on the record, you will have to describe in a square and where it is?

A. I will. The tenth sample was taken off Stapleton, and is located as indicated by a square with *with* the figure ten. The eleventh sample was taken between Stapleton and Fort Wadsworth, and is located as indicated by a square with the figure 11 within it. The twelfth sample was taken at a point southeast of the eleventh and is indicated by the figure 12 within a square. The next sample was taken near Fort Wadsworth, and is located as indicated within a square by the figure 13. The next sample was taken at Fort Wadsworth and is numbered 14 and location indicated by a square with the figure 14 within it; the next sample indicated by the figure 15 within a square near Fort Wadsworth at the Narrows. The next sample was taken just south of Fort Wadsworth in Upper Bay and is located as indicated by the figure 16 within a square.

The next sample is indicated by the figure 17 within a square southeast of the figure 16.

There was another series taken beginning 18. It is six
583 years since I examined this closely, and, I shall have to find its location on th- map. It is the figure 18 indicating the location where the sample was taken, in a series intended to run through Gravesend Bay. Figure 18 is within a square at the Narrows, near Fort Hamilton.

The next sample is represented by figure 19 within a square south of Fort Hamilton.

The next sample is indicated by 20 within a square on the shores of Gravesend Bay.

Next sample indicated by figure 21 within a square in Gravesend Bay.

Next sample indicated by figure 22 within a square in Gravesend Bay.

Next sample indicated by figure 23 within a square in Gravesend Bay.

Next sample indicated by the figure 24 within a square in Gravesend Bay.

Next sample indicated by the figure 25 within a square in Gravesend Bay.

Next sample is indicated by figure 26 within a square in Gravesend Bay.

Next sample is indicated by the figure 27 within a square in Gravesend Bay.

The next sample is indicated by the figure 28 within a square in Gravesend Bay.

The next samplae is indicated by the figure 29 within a square in Gravesend Bay.

The figure 30 indicates where the last sample was taken in Gravesend Bay nor*ht* of Nortons Point.

In this calculation of analyses, shell fish were also included with the water in the numbering and to be perfectly lucid with
584 respect to the location where samples of shell fish were taken and samples of water, I shall have to have an opportunity to consider the map more fully than I can do at this moment. I can indicate where sampling was made however. I think from this point up to the end of the numbers indicated on the map.

Cross-examination by Mr. Riker:

Q. You mean shell fish?

A. Sampling of shell fish or of water. I might say in this connection that it is the general opinion, I think you will find undisputed among sanitary experts, that an examination of shell fish gives a fairly good indication of the average condition of the water which the shell fish have been living in.

Q. You did not, I suppose, make any further personal sampling of the shell fish than you did of the water?

A. No, the work was all done in the same way.

Mr. Riker: Then I shall have my objection noted.

By Mr. O'Sullivan:

Q. Were the samples of shell fish taken under your direction?
A. The work was all done in the same way.
Q. Will you please answer my question. Please repeat my question.
The question was read by the stenographer as follows:
"Q. Were the samples of shell fish taken under your direction"?
A. Yes.

By Mr. Riker:

Q. Now, what direction did you give as to that?
A. The direction I gave was as to the location where the sample was to be taken, the kind of sample and approximately the time.
Q. Well, do you know of your own knowledge whether your directions were followed out?
585 A. I have every reason to believe they were; it was the business of the man who did the work to follow directions of that kind.
Q. Is that all the knowledge you have as to whether your directions were carried out?
A. No.
Q. What other knowledge have you?
A. His report to me on the result.
Q. Anything else?
A. No.

Mr. Riker: I object to this testimony of the ground that this witness does not know anything about what he is testifying to.

By Mr. O'Sullivan:

Q. Did he bring the samples to you, Doctor?
A. He did not.
Q. Did you at any time see the samples?
A. I did not.
Q. Where did he take the samples?
A. He took them to the Mt. Prospect Lab-ratory, except in those cases where samples were sent to the Bender Hygienic Lab-ratory at Albany.

Mr. Riker: I move to strike that answer out on the ground the witness has already said he never saw the samples and therefore he could not know where they were taken.

By Mr. O'Sullivan: How do you know they were taken there, Doctor?
A. By the reports which the analysists made.

Mr. Riker: Now, I object on the ground that by the witness' own testimony his statement is hearsay.
The Commissioner: Note the objection.

Direct examination (resumed) by Mr. O'Sullivan:

586 Q. Who collected these samples?
A. Daniel D. Jackson.

Mr. Riker: I move that that be stricken out on the ground that the witness says that he never saw the samples and therefore he could not know who collected them.

Q. To whom did you give directions to collect the samples, Doctor?
A. Daniel D. Jackson.

Mr. Riker: I object on the ground the question is entirely irrelevant, and incompetent.
The Commissioner: Note the objection.

By Mr. O'Sullivan:

Q. Doctor, what other analyses where made under your direction as are indicated on this map?
A. I do not remember any that were made except those that I have already referred to.
Q. How many analyses of water were made altogether, Doctor, or rather, how many samples of water were collected under your direction for analyses?

Mr. Riker: I object on the ground that this witness has testified that he did not see the samples taken and has never seen them, therefore he cannot know and his testimony is hearsay.
The Commissioner; Note the objection.

The Witness: I think the number was fifty.
Q. Have you described all the fifty in your testimony?
A. No.
Q. Will you take up where you left off and finish the series for water?

Mr. Riker: That is objected to on the same ground.
The Commissioner: Note the objection.

The Witness: A series began at Stapleton, Staten Island. The location of the sample is indicated by the figure 31 within the square.

587 The second sample was collected between Stapleton and Fort Wadsworth; its location is indicated by the figure 32 within a square, between Stapleton and Fort Wadsworth.
A sample was taken in the Narrows, its location is indicated by the figure 33 within a square.
A sample was taken between Hoffman Island and Staten Island. Its location is indicated by the figure 31 within a square.
A sample was taken on the south side of Staten Island, its location is indicated by the figure 35 within a square.
A sample was taken on the south side of Staten Island, numbered 36 within a square.

A sample was taken near the south side of Staten Island. Its location is indicated by the figure 37 within a square.

A sample was taken near the mouth of Great Kills, Staten Island. Its location is indicated by the figure 38 within a square.

A sample was taken in Great Kills Staten, Island. Its location is indicated by the figure 40 within a square.

A sample was taken on the south side of Staten Island to the south of Great Kills. Its location is indicated by the figure 41 within a square.

A sample was taken between Great Kills and Lemon Creek, Staten Island. Its location is indicated by the figure 42 within a square.

A sample was taken off the mouth of Lemon Creek. Its location is indicated by the figure 43 within a square.

A sample was taken in Princess Bay, Staten Island. Its location is indicated by the figure 44 within a square.

A sample was taken in Lemon Creek; its location is indicated by the figure 45 within a square.

A second sample was taken in Lemon Creek. Its location
588 is indicated by the figure 46 within a square.

A sample was taken off the south side of Staten Island between Princess Bay and the mouth of the Raritan River. Its location is indicated by the figure 47 within a square.

A sample was taken off the southernmost point of Staten Island, in Raritan Bay. Its location is indicated by the figure 48 within a square.

A sample was taken in the mouth of the Arthur Kill. Its location is indicated by the figure 49 within a square.

A sample was taken in the Arthur Kill near Perth Amboy. Its location is indicated by the figure 50 within a square.

That completes the series.

Q. Where were the samples of shell fish collected, Doctor?

Mr. Riker: I object of the same ground.

The Commissioner: Note the objection.

The Witness: I have included the samples of shell fish and water in these series.

Q. Doctor, I direct your attention to page 56 of that first report of the New York Bay Pollution Commission and the table at the bottom of the page. You give the number of shell fish examined, first item 6 Clams. Did that mean six samples or one sample taken at one time?

Mr. Riker: I object to that question on the ground that this table has not yet been identified with anything that is within the knowledge of this witness.

The Commissioner: Note the objection.

Mr. O'Sullivan: I withdraw my question.

Q. Doctor, I directed your attention to page 56 of Senate Document 39, being the Report of the New York Bay Pollution Commission to the Honorable Frank Walen Higgins, Governor,
589 dated March 31, 1905, and ask what that table at the base of the page 56 comprises, if you know.

Mr. Riker: Well, I object on the ground the witness should show his knowledge before he testifies as to the contents of the document.
Mr. O'Sullivan: I ask if he knows.
The Commissioner: Note the objection.

The Witness: It show- the results of examinations of B. Colli and 51 specimens of oysters and clams grown in the waters of Lower New York Bay.
Q. Is that part of the investigation conducted by you?
A. Yes.
Q. What was your object in testifying for Colli?
A. To obtain knowledge as to the presence of fickle bacteria.
Q. What is Colli regarded as an index of?
A. It was regarded as the index of the presence of sewage matter when found in sufficient quantity.
Q. In the oysters and clams examined were they of the samples you collected under your direction,—did you find any evidence of Colli?
A. Yes, sir.
Q. What evidence did you find, Doctor?
A. The evidence indicated in the table at the foot of page 56.
Q. How do you distinguish there between the samples which showed presence of Colli and those which did not, Doctor?

Mr. Riker: You are examining him on this table now?
Mr. O'Sullivan: Yes.
Mr. Riker: I would like to examine him on the use of the table.
Mr. O'Sullivan: All right.

By Mr. Riker:

190 Q. Did you personally make the analyses of these shell fish?
A. I did not.

Mr. Riker: I object on the grounds that the testimony is hearsay.
The Commissioner: Note the objection.

By Mr. O'Sullivan:

Q. Who compiled that table, Doctor?
A. I compiled it.
Q. From what?
A. From a report submitted to me by Daniel D. Jackso. of the Mt. Prospect Lab-ratory.
Q. Was Dr. Jackson working under your direction?
A. He was.
Q. What reports did he furnish in relation to what?
A. Reports of analyses of samples of water and shell fish taken at places he had been directed to take them from by me.
Q. And the subsequent reports he made, I understand you to say, you codified or arranged in this tabular form?
A. Yes.
Q. Do you know what methods the collection was made under?

Do you know the condition of the tides or did you make suggestions on either to the one who made the collections?

Mr. Riker: I object to the question on the ground that it is double, and cannot be answered in one answer. You asked whether he knows and counsel asked the witness — knows the conditions and then asked what directions he gave.

Mr. O'Sullivan: Withdraw the question.

A. Did you give any directions as to the tides and as to the time and as to the location for the collection of these samples and the conditions under which they were to be collected?

A. I did.

Mr. Riker: I object on the ground that it is immaterial
591 what directions were given unless it can be shown what was actually done.

The Commissioner: Note the objection.

Q. And was Mr. Jackson employed for the special purpose of following these directions and report to you the results thereof?

Mr. Riker: I object on the same ground. I object on the ground that it is immaterial what instructions or directions were given to Mr. Jackson.

The Commissioner: Answer the question.

The Witness: He was so employed.

Q. What reports were made on the investigations of the water samples?

Mr. Riker: Object on the ground that it is immaterial what reports were made on the samples taken as it has been testified to by this witness that his knowledge is merely hearsay.

The Commissioner: Note the objection.

Mr. O'Sullivan: Read the question.

The question was read by the stenographer as follows:

"Q. What reports were made on the investigation of the water samples?"

The Witness: Reports were made on blank forms such as are commonly used for that purpose. They were made, or—perhaps I had better wait for a more explicit question from you.

Q. I direct your attention to page 55 of the Senate Document No. 39 being a report of the New York Bay Pollution Commission to the Honorable Frank Walen Higgins, Governor, March 31, 1905, and direct your attention to the table on page 55 and ask you who compiled that table?

A. I compiled that table.

Q. From what data?

A. From data supplied me by the analyst.

592 Q. Who was the analyst?

A. And from data—and from other data—the other data were official records of tidal phenomena and of weather conditions.

Q. You say official data, official how?

A. United States Government records——

Q. (Interrupting.) Geodetic?

A. (Continuing.) For the weather. United States weather Bureau and for the tidal phenomena, United States Coast and Geodetic Survey.

Q. What directions did you give Mr. Jackson relative to his analyses of the water samples so collected?

Mr. Riker: Objected to on the ground it is immaterial.

The Commissioner: Note the objection.

The Witness: I directed him to take his samples at the points indicated by me a few moments ago, and at the stages of tide which are reported upon in this report, which I made to the Pollution Commission. If you wish me to be specific I can tell you in further detail.

Q. Yes, sir.

A. It seemed best to make the examinations in such a way that would give the greatest amount of information for the labor to be expended upon them, and——

Mr. Riker (interrupting): Excuse me a moment, Doctor.

The Witness: Yes.

Mr. Riker: This method of getting testimony by way of running discourse is impossible of checking up and properly objecting to it. I therefore object to the volunteering of testimony by the witness except in answer to specific questions which are subject to objection.

The Commissioner: Note the objection.

The Witness: It seemed unnecessary to make some determinations which are comomnly employed in a sanitary analyses of water, as, for example, loss on evaporation. The result of that examination would be of doubtful value. The determination of total solids or residue on evaporation seemed also likely to be of little or no service, consequently Dr. Jackson was requested to omit these determinations and some others, notably, color, turbidity, and, I think salinity.

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Mr. Riker: I now object to this testimony since my last objection and give notice that I shall move to strike it out on the ground that the testimony is manifestly immaterial, irrelevant, and hearsay.

The Commissioner: Note the objection.

Q. Are you stating now the directions that you gave Dr. Jackson, Dr. Soper?

A. Yes.

Q. You may proceed?

A. It seemed unnecessary and undesirable for the same reason to attempt to make determinations of the nitrites and nitrates. They were consequently omitted from the examination. The determinations which Dr. Jackson was directed to make were free and albuminoid ammonia, numbers of bacteria and the presumptive test for the identification of the Colli bacillus.

The Commissioner: We will take a recess until 2 o'clock.

594 CITY HALL, NEW YORK,
September 18th, 1911—2 o'clock p. m.

The hearing was resumed at 2 P. M. and on agreement of counsel was adjourned until 10:30 tomorrow morning.

Adjourned to September 19, 1911, at 10:30 A. M.

595 Supreme Court of the United States, September Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK,
September 19th, 1911—10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York; William A. McQuaid, Esq., Deputy Attorney General, and Dr. William J. O'Sullivan, Special counsel for The People of the State of New York, Complainants.

Edmund Wilson, Esq., Attorney General of the State of New Jersey; Robert H. McCarter, Esq., of counsel for the State of New Jersey; Joseph Coult, Esq., and Adrian Riker, Esq., of counsel for the Passaic Valley Sewerage Commission, Defendants.

596 Dr. GEORGE ALBERT SOPER, a witness in behalf of the Complainants, recalled, testified as follows:

Direct examination (resumed) by Mr. O'Sullivan:

Q. Dr. Soper, I hand you Complainant's Exhibit No. 2 and ask if the map in that exhibit is the one that you indicated the localities from which water samples and fish samples were taken in your testimony of yesterday?

Mr. Riker: Please read the question.

The question was read by the stenographer.

Mr. Riker: I object to the question because it was not the one that he used.

The Commissioner: Note the objection.

Mr. O'Sullivan: Use the word "Similar."

Mr. Riker: A copy of it.

Mr. O'Sullivan: No, it is not a copy.

Mr. Riker: Duplicate. All right.

The question was read to the witness.

The Witness: Yes.

Q. What special feature of the work was assigned to you by that Commission, Doctor?

A. Sanitary and bacteriological examinations and fisheries and industries affected by pollution of New York Harbor.

Q. In undertaking to determine what the present chemical and bacterological condition of the harbor and fisheries were at that time, how did you undertake the work? What did you do?

A. I had analyses made of samples of water and shell fish and when those analyses were reported to me, I interperted them in connection with information obtained from the United States Weather Bureau and the United States Coast — Geodetic Survey, and wrote a report on the result. With respect to the conditions of the water,

I also made a research of the literature on the subject and
597 found in two official reports, information which I utilized also. One of those reports was made by H. W. Clark and contained in the reports of the Metropolitan Sewerage Commission of Boston upon a high level sewer for the relief of the Charles and Neponset Valleys and the other report was that of Mr. G. C. Whipple, contained in the report of the Commission on an additional water supply for the City of New York. There was a third report by Mr. H. W. Clark contained in the report of the committee on the Charles River Dam, Boston.

The pages of those reports which were of special use, were page 91 of the report of Mr. Clark for the Metropolitan Sewerage Commission of Boston; page 520 of the report of Mr. Whipple to the Commission on an additional water supply for the City of New York; and page 221 of Mr. Clark's report of the Charles River Dam.

With respect to the tidal phenomena dealt with also in my report to the Pollution Commission, examination was made of reports of the United States Coast and Geodetic Survey, especially Appendix 15 of the Report for 1887, page 308.

In the matter of the foregoing beyond that question of the conditions of the waters, I might say that the results of the analyses made for the Pollution Commission under my direction and the results of other analyses were tabulated and the position of the sampling stations indicated on a chart.

In the matter of the industries affected by pollution, I made examination of official reports of the United States Commission of Fish and Fisheries for 1902, finding material of special interest on page 449.

In respect to the shell fish I consulted with the superin-
598 tendent of the Shell fish Bureau of the Forest Fish and Game Commission of the State of New York, as to the location and the value of the shell fish industries in the metropolitan district, and conferred with many oyster men.

The Bureau of Census, I think, furnished me with information concerning the number of persons engaged in the shell fish industries, the number and value of vessels—fishing vessels, transporting apparatus used in the fisheries and shore property; also information concerning the number of bushels of shell fish taken, and their value. The statistical information just referred to was examined in connection with results of analyses just mentioned and various deductions and opinions and inferences drawn from that study.

Taking up the passenger transportation business, endeavor was made to determine the number of passengers carried by the principal ferry companies across the waters of the Metropolitan District.

Mr. Riker: Excuse me a moment; I want to put an objection upon the record. Mr. Commissioner I object to this testimony and move to strike it out, first: because it is not responsive to any question, secondly: because it is hearsay, immaterial and irrelevant.

The Commissioner: Note the objection; proceed.

The Witness: The route of the ferry companies——

Mr. O'Sullivan: One moment, Doctor. Did you gather the data that you are now describing, yourself?

The Witness: Yes, personally.

Q. You may proceed.

Mr. Riker: The objection is renewed.

The Witness: The route of the ferry companies was ascertained.—the data concerning the transportation business and the
599 number of passengers carried by each ferry company was obtained from the United States Steamboat Inspection service, an dthe information so collected by me was tabulated and various inferences, opinions, and deductions drawn from them.

By Mr. O'Sullivan:

Q. Does that appear on any page in Complainant's Exhibit No. 2?

A. It appears on pages 78 and 79.

Q. You may proceed, Doctor?

A. With respect to excursions and bathing beaches, information was obtained from the United States Steamboat Inspection Service concerning the number of passengers carriers in the year 1903 on excursion steamers. Other facts were obtained by me concerning the destination of excursion steamers and the apparent purpose of the excursionists. The subject was made the topic of a study which is recorded on pages 79 and 80 of Exhibit No. 2.

The project of the Passaic Valley Sewerage Commission as announced at that time, was examined briefly.

Q. By whom, Doctor?

A. By me. To determine some of the salient features of it as they related to the harbor of New York and a search was made by me to find precedents for what might be expected as a consequence of discharging the sewage of the Passaic Valley at Robbins Reef, according to my understanding of the announced plans of the Passaic Valley Commission, and the situation in Boston Harbor seemed to be the nearest approach to it, and was consequently examined with some care.

I think I took a trip (I shall be able to tell you later, perhaps) to Boston at that time. In any event, I obtained reports of the Massachusetts State Board of Health concerning the conditions in Boston Harbor and made a study of them from which I drew various inferences and opinions concerning the probable consequences

which would follow from the discharge of the Passaic Valley
600 Sewage, according to the plan then announced. The studies of the Passaic Valley project are recorded on pages 80, 81, 82, 83 and 84 of Exhibit No. 2.

From all of my *duties* of the sanitary condition of the water and of the industries affected by pollution of the fisheries, I drew thirty definite conclusions, which are stated numerically in pages 84, 85, 86, 87 and 88 of Exhibit No. 2.

Am I desired to continue to the next report?

Q. Yes, sir. Well, just a moment. How many samples of water were gathered and subjected to analyses under your direction?

Mr. Riker: I object on the ground that this witness has already said that he has no personal knowledge that any water samples were gathered

The Commissioner: Note the objection. Proceed.

The Witness: Fifty analyses were made during the first stage of this work. The first stage is recorded in Exhibit No. 2. There was a subsequent stage——

Q. (Interrupting). We will come to that later, Doctor; we are dealing with this first stage. How many samples of shell fish were taken under your direction and examined and for what were they examined?

Mr. Riker: I object to that on the ground that this witness has said that he has no personal knowledge that any samples were taken.

The Commissioner: Note the objection. Proceed.

The Witness: Fifty-three.

Q. Did you tabulate those, and if so, do they appear on any page of Complainant's Exhibit No. 2?

Mr. Riker: I object to it on the ground that the tabula-
601 tion in the evidence of this examination is immaterial and irrelevant.

The Commissioner: Note the objection.

The Witness: They appear on page 56 of Exhibit No. 2.

Q. Were the water samples that were gathered under your direction, and examined subsequently under your direction tabulated by you, and if so, do they appear on any page of Complainants' Exhibit No. 22

Mr. Riker: The same objection.

The Witness: They were tabulated by me and appear on pages 51, 52, 53, 55, 59, 60, 62, 63, 64, 65, 66 of Exhibit No. 2.

Q. Directing your attention to the first of these tabulations on page 51, what was the object of the analyses made?

Mr. Riker: I object to it on the ground that it is immaterial and irrelevant.

The Commissioner: Note the objection.

The Witness: The object was to determine the condition of the water as to its bacterial content and consequently its pollution at the following points: North River at head of Pier 1; Upper New York Bay, south of Liberty Island; Upper New York Bay near Robbins Reef; Narrows off Gravesend Bay; the Lower Bay south of Sea Gate; the Lower Bay at the Iron Steamboat Company's Pier-head at Coney Island.

Q. Where the points on which these samples were selected indicated on Complainants' Exhibit No. 2, on the map by any distinctive numeral or otherwise?

A. They are indicated on that map by the numbers from 1 to 7 respectively.

Q. Directing your attention to the tabulation that appears on page No. 52 of Complainants' Exhibit No. 2, did you compile
602 that tabulation?

A. I did.

Q. And what was the object of the tests that the water samples were subjected to under your direction?

Mr. Riker: Same objection as to the last question, as to the testimony on the last tabulation.

The Commissioner: Note the objection.

The Witness: To determine the condition of the water as to its basterial content and consequently its pollution at the following points: St. George; end of East Pier, Tompkinsville; end of South Pier Stapleton; Yacht Club Dock between Stapleton and Clifton; Rosebank; Narrows above Fort Wadsworth; east of Fort Wadsworth; South of Fort Wadsworth; South Beach at its upper end; South Beach opposite its middle.

Q. Did you subsequently have these points at which the samples were taken plotted on the map which forms part of Complainants' Exhibit No. 2?

A. They were so plotted and are designated by the numerals 1 to 17 inclusive, enclosed within squares.

Mr. Riker: Aren't you in error about that?

Q. Do you mean 1 to 17 or 8 to 17?

A. 8 to 1.

Q. Doctor, I direct your attention to page 53 of Complainants' Exhibit No. 2, and ask who prepared the tabulation that appears on that page?

A. I prepared it.

Q. For what purpose were the water samples that were gathered and subjected to analyses under your direction, examined for?

Mr. Riker: Same objection as to the last questions and the last tabulation.

The Commissioner: Note the objection.

The Witness: They were examined to determine their bacterial condition, throw light on the pollution of the water at the following points: Fort Hamilton, 100 feet south; Fort Hamilton Beach, 100

603 feet south of west end; Fort Hamilton Beach, 100 feet south of east end; off Field and Marine Club, 20 feet from raft 100 feet off Vecca Villa pier; 150 feet off beach below Captains' Pier; 100 feet off pier of New York Canoe Club; 75 feet off public camp ground; opposite Coney Island 300 feet from shore; opposite Coney Island half way across Bay; north of pier at Atlantic Yacht Club; opposite Sea Gate 200 feet north—opposite Sea Gate 500 feet north.

Q. Are the locations from which these samples were taken plotted on the map that is part of Complainants' Exhibit No. 2, and if so, state how they are so plotted?

A. They are plotted and indicated by numerals in rectangles running from No. 18 to 30 inclusive.

Q. I direct your attention, Doctor, to page 55 of Complainants' Exhibit No. 2 and ask who prepared the tabulation that appears on that page?

A. I prepared the tabulation which appears on page 55.

Q. For what purpose were the samples of water subjected to analyses under your direction?

Mr. Riker: Same objection as made to the like question on the preceding tabulation.

The Chairman: Note the objection.

The Witness: To determine the bacterial condition of the water in order to throw light on its condition of pollution at the following points: Stapleton Dock, off Rosebank; 100 feet of- Fort Wadsworth; between Hoffman Island and South Beach off Creek above Midland Beach; off Elm Tree Beacon, between Elm Tree Beacon and Great Kills; Great Kills point; Great Kills; near shore south of Great Kills off Latterette Point; off Seguins Point; Princess Bay; Lemon Creek, at Bridge; Lemon Creek 500 feet above Bridge; Red Bank; Staten Island off Wards Point; between Wards Point and
604 Tottenville and off Tottenville

Q. Are these points plotted, and if so, are they indicated by any special numerals or otherwise on the map that forms part of Complainants' Exhibit No. 2?

A. They are so plotted and indicated by numerals, enclosed in rectangles running 31 to 50 inclusive.

Q. Doctor, I direct your attention to page 56 of Complainants' Exhibit No. 2, and ask who prepared the tabulation that appears on that page?

A. I prepared that tabulation.

Q. What was the object of subjecting the samples of water to chamical analyses?

Mr. Riker: Same objection as to the last preceding tabulation.

The Commissioner: Note the objection.

Q. Or to biological examination?

A. Those were shell fish on page 56.

Q. Oh, the shell fish, yes; I beg your pardon.

A. The object in examining them was to determine their bacterical

condition in order to throw light on the condition of the pollution of the water.

Q. Where were those shell fish collected, at what point?

A. Six clams were collected in Gravesend Bay near Sea Gate; Six oysters near the same point; five oysters at Gravesend Bay, Bath Beach; six oysters off Elm Tree Beacon in the lower Bay; Six oysters in Swash Channel; ten oysters in Great Kills; six oysters in Princes Bay; six oysters from Princess Bay, which had been drinked in Lemon creek.

Q. What does that expression mean, Doctor, drinked?

A. It means the bloating and bleaching of oysters by placing them into water of less salinity that the water in which they have been growing. It is a common practice among oyster men, and
605 at the time that this report was made, the water in which the oysters were drinked was found very foul. The places in which the oysters were put were in some cases conspicuously unsuitable.

Q. In what way, Doctor?

A. Unsuitable, by reason of the heavy pollution to which the waters were subjected.

Q. Polluted by what, Doctor?

A. Polluted by sewage.

Q. What was the object of the analyses that these clams and oysters were subjected to under your direction?

A. To give information concerning the condition of the water in which the shell fish existed and the condition of the shell fish themselves with respect to sewage pollution.

Q. I direct your attention to page 59 of Complainants' Exhibit No. 2, and ask you who prepared the tabulations that appear on that page?

A. I prepared those tabulations.

Q. Taking the first of those tables, what was the object of the collection of the samples of water under your direction?

Mr. Riker Same objection.

The Witness: These samples were not collected under my direction. They represent the analyses of samples collected in other researches. The information contained in the first table on page 59 was collected by me, the information therein contained having been extracted from the reports of Messrs. Clark and Whipple, already referred to a few moments ago by me.

Q. And what was your object in reaching determinations for free ammonia and albuminoid ammonia in the first table on that page?

A. The object was to show what might be fairly considered the average condition as to free and albuminoid ammonia in clean sea water, in sewage, in clean drinking water and in the Hudson river at Poughkeepsie.

Q. Did you regard these as standards for comparing subsequent conditions?

606 Mr. Riker: I object to that as immaterial how he regarded them the question is whether they were standards.

Mr. O'Sullivan: It affects his reason in these matters.
The Witness They were so regarded.
Mr. Riker: By you; I presume the witness means himself.

By Mr. O'Sullivan:

Q. By you, Doctor, and they were accepted by the commission as standards?
A. Yes.
Q. The New York Bay Pollution Commission?
A. I think that my report was accepted in its entirety by the commission without any qualifications, and I think it was largely abstracted in making up the full report of the commission.
Q. After establishing standards such as you have described for clean sea water, for good drinking water, did you continue in your investigations by subjecting any samples of our river water to chemical analyses?

Mr. Riker: Wait one moment; I object on the ground that it does not yet appear that he has established any standard except for his own satisfaction, and that the standards which are supposed to be incorporated in this report are not properly established as standards.

By Mr. O'Sullivan: Doctor, directing your attention again to the first table on page 59, for what purpose did you compile that tabulation, and state whether or not it guided you in continuing your work of other analyses or reasoning on analyses

Mr. Riker: I object to that question on the grounds that it is double, and on the further ground that it is leading and that it is immaterial and irrelevant in any case.
The Commissioner: Note the objection.

607 By Mr. O'Sullivan: You may proceed, Doctor?
A. The object in preparing that table was to fix as nearly as could be, upon the amount of free and alluminoid ammonia which clean sea water might *to* expected to contain, and which sewage might be supposed to hold, and which good drinking water might be believed to possess, and which the Hudson River at Poughkeepsie had been found to contain. These figures were obtained from reports of other researches, and have been described, recorded, by well known experts. The object was to establish a point from which to interpret the results of analyses of water of New York Harbor.
Q. And as to that extent?
A. (Interrupting.) They were regarded as convenient standards for this use.
Q. Now, having established your standards, Doctor, for sea water, drinking water, did you proceed to have samples of water from any point in our Harbor water and the rivers on each side of Manhattan examined?
A. I *porceeded* to examine the results of fourteen chemical analyses of the waters of New York Harbor showing free and albuminoid Ammonia as had the standards referring to clean water and sewage.

Q. At what points did you make the collections or have the collections made of these samples?

A. The three points. Results were available for three points in Upper New York Bay as a result of analyses made under my direction. Pier No. 1 North River; the Narrows and the Lower Bay at Coney Island.

Q. Were these samples plotted on the map contained in Complainants' Exhibit No. 2, and if so, how are they so plotted?

A. They were plotted and indicated by the numbers 1, 4, 7, respectively, enclosed in rectangles.

Q. Were other samples collected at any points in our harbor waters?

A. There have been other samples collected for another research and the results of those analyses were available in the report of Mr. Whipple, and contained in the report of the commis-
608 sion on an additional water supply for the City of New York, page 520 *et* follows:

Mr. Riker (interrupting): I object to the use of unproved documents.

Mr. O'Sullivan: May it please the commission, these matters are spread upon the record to show every fact and circumstance, standard and research, made and accepted by other investigators that in any way influenced the determination of this witness in arriving at conclusions which we shall later direct his attention to. You may proceed, Doctor.

The Witness: Hudson River at 30th Street; at the Battery; at the Battery; at Robbins Reef; at Robbins Reef; at the Narrows; at the Narrows; at Rockaway Bell Buoy; at West Bank Light; at Sandy Hook Light; and opposite Sandy Hook Light. Where the point of collection has been twice mentioned, one sample has been taken during the ebb tide and another during flood.

Q. Did you prepare that second table of page 59 of Complainants' Exhibit No. 2?

A. I did.

Q. And for the purposes for which you stated?

A. I did.

Mr. Riker: Well, I object to that question as calling for a general conclusion and also on the preceding grounds as to the other questions as to the other tabulations.

The Commissioner: Note the objection.

Q. I direct your attention to the table on page 60 of Complainants' Exhibit No. 2, and ask you, Doctor, who prepared that?

A. I prepared that table.

Q. Who made the analyses from which you compiled that table, Doctor?

A. George C. Whipple.

Mr. Riker: How does he know that? I don't think it is fair to this witness unless he was present.

Mr. O'Sullivan: Mr. Riker asks a question, how do you know that?

609 The Witness: They were reported by Mr. Whipple as having been made by him; reported in Mr. Whipple's report to the commission on an additional water supply for the City of New York.

Q. Is that a regularly published report?

A. It is.

Q. In print?

A. It is regarded as one of the classics of the Literature on the subject of Water Supply.

Q. And is it available to any one who wishes to secure a copy?

A. I have never had any difficulty in finding it in libraries, public libraries.

Mr. O'Sullivan: Has the witness answered your question, Mr. Riker?

Mr. Riker: I do not think he has. I do not think he said that the report states that Mr. Whipple himself made these analyses, and I do not think the report will be found that will state it anywhere, that Mr. Whipple himself made the analyses. That is rather a far call for a witness under oath to say as a matter of fact somebody made an analyses, when, as a matter of fact, he does not know anything about it. That is my objection. If you are satisfied with it, I have no reason to criticize it.

The Witness: Are you looking to me for a reply?

By Mr. O'Sullivan: Yes; you may reply to it Doctor. Mr. Riker seems to think that you have not had sufficient facts to base your statement that the analyses were made by Mr. Whipple?

A. Mr. Whipple was employed to make analyses. He reported his work. I believe Mr. Whipple to be an honorable man, and consequently place implicit confidence in his report.

Q. And in his statement that he made the analyses?

A. Yes.

Mr. Riker: That is what the witness means when he says that certain things were done, that he believes a statement he has represents the truth.

610 Mr. O'Sullivan: The witness is disclosing to you, Mr. Riker, through this statement, the standard which he accepted on which he guages the merits of the work done under his direction.

Mr. Riker: All right.

Q. Did any part of the work done under your direction, Doctor, relate to the effect of tides and currents, and other purifying agencies on the pollution that you describe and tabulated in the previous tables referred to?

A. Whenever analyses were made from samples of water reported by me in Exhibit No. 2, in connection with the condition of the weather which obtained when the samples were taken, with special reference to wind and the time of high and low water at the nearest point where observations of the tide were made by the United States

Coast and Geodetic Survey, and from this information inferences were drawn by me concerning the effects of tides and currents and other purifying agencies upon the quality of the water.

Q. I direct your attention to the first table that appears on page 62 of Complainants' Exhibit No. 2, and I ask who prepared that table?

A. I prepared that table.

Q. From what data?

A. From Mr. Whipple's report already referred to.

Q. With what object, Doctor?

A. In order to throw light upon the proportions of sea and land water found at various points in New York Harbor.

Q. Did you use that table as a standard for guiding you in your subsequent work, or for comparing the work that you were actually doing at that time?

A. It was used in part as a standard and in part to throw light on the condition of the water at points which we could not collect samples from.

—. Directing your attention to the second table that appears at the bottom of page 62 of Complainants' Exhibit No. 2, I ask
611 you, Doctor, who prepared that table?

A. I prepared that table.

Q. From what data?

A. From data collected by Mr. Jackson under my direction.

Q. Is Mr. Jackson in this room?

A. Mr. Jackson is.

Q. Where were these samples taken from under your directions?

Mr. Riker: Objected to on the ground that the witness has already testified that all he did was direct that they be taken; that is no record where they were taken.

The Commissioner: Note the objection.

The Witness: The samples were taken from points designated on the map accompanying — part of Exhibit No. 2, numerals included within squares running from Nos. 31 to 50, inclusive.

Q. And taken at the points indicated in the tables?

A. At the points indicated in the table.

Q. And for what purposes did you instruct the analyses to be made?

Mr. Riker: Objected to on the ground that the purposes of tabulation of analyses under these conditions is immaterial and irrelevant.

The Commissioner: Note the objection.

The Witness: In order that information might be obtained from which I could calculate the approximate percentage of sea water and land water present.

Q. I direct your attention, Doctor, to page 63 of Complainants' Exhibit No. 2, and ask who prepared that table that appears on that page?

A. I prepared that table, and from information obtained by Mr. Jackson under my direction.

Q. Does that table indicate the location from which samples were collected?

A. It does. The location- from which samples were collected are indicated in numerals from 18 to 30, inclusive, within rectangles plotted on the map, which is a part of Exhibit No. 2.

612 Q. I direct your attention to page 64 and to the table appearing on that page on Complainants' Exhibit No. 2, and ask who prepared that table?

A. I prepared that table on page 64.

Q. Where did you get the data that you prepared that table from, Doctor?

A. The data were obtained in part from analyses made by Dr. Jackson, under my direction, and partly from the report of the Commission on an Additional Water Supply for the City of New York.

Q. What part of that table was prepared by others than Mr. Jackson? I mean what part of the determination that appears on that paper was prepared by other than Mr. Jackson?

A. The items which are without map numbers.

Q. And for what purpose were they inserted in this table, those that were prepared without map numbers?

Mr. Riker: Objected to on the grounds that the data has not been proved and its purpose is therefore irrelevant.

The Commissioner: Note the objection.

The Witness: In order to unilize all available facts, throw light on the question and because these seemed to be reliable results of such analyses as were being made for the Pollution Commission.

Q. In other words, did you use the first two items that appear on that table, on page 64 as standards for measuring the importance or significance of other items appearing in that table?

A. No.

Mr. Riker: I object on the ground that that question is leading.

The Commissioner: Note the objection.

The Witness: No.

Q. Of what importance, then, is there attached to the fact that you inserted those items made by another observer than Mr. Jackson?

613 A. Additional information. We wished all the information we could obtain, and when we found, as we believed, it, reliable results of analyses, we incorporated them and utilized them in the table.

Q. For what purpose, Doctor?

A. We gave them the same weight as we would give other items of analyses in the table.

Mr. Riker: I object to that answer on the ground that it is not responsive.

The Witness: To be more specific we utilized the first two items to give us knowledge of the approximate percentage of sea water at the Narrows on February 26th, 1903, on the ebb tide, and at the Narrows on February 27th, 1903 on the flood tide.

Q. Taking those two items that appear towards the end of the table indicated by the word "Battery" what would you say of those two items in the table?

Mr. Riker: I object to the question on the ground it calls for—it is indefinite in its character and the purpose cannot be disclosed,—is not disclosed.

The Witness: One comment I would make on that pair of results is that there is a misprint in the year in which the first sample was taken. Instead of "0319" the year should be "1903." The first analyses was used to indicate the approximate percentage of sea water at the Battery on February 27th, 1903 during the flood tide, and the second item to indicate the approximate percentage of sea water at the Battery on February 26th, 1903, on the ebb tide.

Q. With the exception of these four items, the two beginning with the word "Narrows" and the second and third last words "Battery" with the exception of these four items, who did the rest of the work that is embodied in that table?

A. The analyses.

Q. Yes?

A. The analyses were reported to me by Mr. Jackson.

614 Q. And did you plot this work of the map which is part of Complainants' Exhibit No. 2?

A. The location where the samples regarded were collected, indicated by numbers in squares on the chart which is a part of Exhibit No. 2. The numerals follow: 4, 13, 14, 15, 18, 19, 20, 33, 8, 9, 10, 31, 11, 12, 32, 2.

Q. Did you mention that last item the figure 1?

A. 1.

Q. I direct your attention to page 65 of Complainant's Exhibit No. 2 and ask you who prepared the table appearing on that page?

A. I prepared that table.

Q. From what data?

A. From data contained in the report of the commission on an additional water supply for the City of New York. I believe it to be the result of analyses taken from 8 A. M. to 7 P. M. on March 3rd, 1903.

Q. Taken every hour?

A. Yes, from 8 A. M. to 7 P. M.

Mr. Riker: He said he believed it to be.

The Witness: I said so.

Q. On what rests your belief, Doctor?

A. My belief rests upon the report of the analyst.

Q. Well, who is the analyst?

A. George C. Whipple.

Q. I direct your attention to page 68 of Complainants' Exhibit No. 2, and ask who prepared the table appearing on that page, Doctor?

A. I prepared the table.

Q. And from what data, sir?

A. From data contained in the report of the commission on an additional water supply for New York City.

Q. As a result of the chemical analyses and bacteriological examinations made under your direction, and which you have described, what do you find the conditions of the harbor water to be, Doctor, at the time you made this report?

Mr. Riker: I object to the question on the ground it calls for a conclusion as to the general conditions of the water from this
615 witness, the data testified to appearing to have been hearsay as far as he is concerned, and being limited to comparatively small detail.

The Commissioner: Note the objection.

Mr. O'Sullivan: Read the Question.

The question was read by the Stenographer.

The Witness: Do you wish me to take up the inferences I drew from the various tables?

Q. Yes, sir.

A. As a result of the study of data, tabulated on the table contained on page 51 of Exhibit No. 2, I drew the following *the* inferences:

This table showes that the number of bacteria diminished with some regularity from the Battery to Coney Island, except in the samples taken off Gravesend Bay where local sources of pollution exist. The tests for Colli are less convincing than the determinations of numbers of bacteria, and indicate an improvement at the Narrows and at Sea Gate over the conditions in Upper New York Bay. In fact the Colli were more often found at Gravesend and Conley Island and in some places where their presence would be more expected, suggests that local contamination existed in these neighborhoods.

On the whole, the water on the incoming was better than the water of the outgoing tide.

I drew the following inferences from my study of the data contained in table on page 52.

Mr. Riker: Do you want this spread on the record? He is simply reading from this exhibit, you know?

By Mr. O'Sullivan:

Q. Doctor, let me ask you one question before you proceed. From page 47 to page 88 inclusive, both inclusive, in Complainants' Exhibit No. 2, I ask you who prepared every fact and cir-
616 cumstance and deduction appearing within those pages? Who wrote them?

A. Who prepared them for this report?

Q. Yes, sir.

A. I did, exclusively.

Q. You may proceed, now, Doctor. You were dealing with the table on page 52 of Complainants' Exhibit No. 2.

Mr. Riker: What is the question, Doctor?

The question was read by the stenographer.

The Witness: The table No. 2 which is contained on page 52 affords an instructive illustration of several matters which were of special importance to this investigation. The North side of Staten Island from the Narrows to St. George was provided with sewerage systems which discharges the sewage of twenty-thousand people, approximately into the waters of the Upper Bay, along the shore. When the samples of water were taken for examination the current was running from east to west along the shore, carrying an increasing load of sewage with it. This is admirably shown by the analyses which indicated a decidedly polluted condition of the water off St. George and a progressive reduction of its impurity from this point to the vicinity of the Narrows. The nearest sewer outfall to the Narrows is the one where sample No. 13 of the table was taken, and beyond this point, the number of bacteria and prevalence of Colli are fairly uniform. The quality of the water in the samples from No. 14 to 17 inclusive is probably a fair indication of the quality of the water which would occupy the lower Bay at the end of the flood tide.

Mr. Riker: Now, at that point, I desire to object to the evidence, testimony of this witness in response to the question that was put to him on the ground that he is not testifying from any present recollection, but is using a printed pamphlet and is simply placing
617 upon the record the contents of a document which — been objected to, and also on the ground that such conclusions and inferences as may appear to have been drawn by this witness are based manifestly upon hearsay data.

The Commissioner: Note the objection.

The Witness: I am using a copy of Exhibit No. 2, to refresh my memory of facts that I have had no occasion to examine in six years; I have been asked to describe the inferences and deductions which I drew from an intimate study of those tables, of data at the time. It would be a feat of memory far beyond my capacity to attempt to give a full description of my inferences and deductions without the use of this report.

Q. Are the parts of the report that you are now referring to in your own very language?

A. My own language prepared by me exclusive.

Q. Written how many years ago?

A. Six years, I think, or more. I will see the date of the report, if I can——

Q. (Interrupting.) The report was dated *in* March 31st 1905, so it was probably written before that time. You may proceed, Doctor.

A. Referring to table No. 3 which is contained on page 53 of Exhibit No. 2, I drew the following inferences:

Table 3 indicates that the water along practically the whole shore of Gravesend Bay is polluted. More than half the examinations for Colli resulted positively, even in samples of water as small as one tenth of a cubic centimeter. The numbers of bacteria were smaller than what would have been expected in view of the known sources of pollution. The colli results for samples No. 20 would hardly

represent the average condition of the water at the point named, for it is within but a few feet of a large sewer outfall.

618 Altogether, the samples although taken along the shore w-ere the contamination ought to be greatest, do not show as much pollution as exists in Gravesend Bay. The incoming tide was distinctly favorable to the purity of the samples. It is likely that Table 3 shows the best conditions which ordinarily occur.

Referring to table No. 4, contained on page 55 of Exhibit No. 2 I drew the following inferences:

"A close study of Table 4 in connection with information concerning the territory from which the samples were taken, lead-s to the opinion, that some of the results were influenced by local sources of pollution. Those about Lemon Creek Nos. 45 and 46 show the effects of drainage which enters that Creek from about 2010 acres of populated country tributary to it. Nos. 48, 49 and 50 show pollution due to sewerage from public sewer outfalls at Tottenville and perhaps more remote points above the Arthur Kill.

The other fifteen samples were not taken within close range of sewers, as far as is known and therefore give a better knowledge of the effect of more distant contamination.

Considered as a whole the table may be divided into three parts: the samples from Rosebank and Midland Beach show marked evidence of Pullution; from Elm Tree Beacon to beyond Great Kills, the water contained a few bacteria a few of the Colli type; from South of Great Kills to Tottenville, there was shown strong evidence of pollution.

Referring now to the inferences drawn from the studies of results of analyses of shell fish: Table No. 5 contained in page 56 of Exhibit No. 2 demonstrates the very important fact that oysters which are grown in polluted water are usually polluted themselves; that the samples examined for this study did not always bear as much evidence of this pollution as might be expected.

619 In view of the known pollution of Gravesend Bay a greater number of positive tests for Colli might have been looked for there. The result may be explained by the fact that the shell fish in that bay are only cultivated in the least polluted localities. The oyster beds on the Staten Island shores seem to lie between two great sources of danger, one being the outlet water which passes up through the Narrows and the other being the contaminated water from the mouth of the Raritan River and the Arthur Kill. The oysters which were the freest from Colli came from the vacinity of the Great Kills and Swash Channel, points which are well removed from local sources of pollution, and apparently beyond the reach of contaminating matters from the city.

The oysters which were drinked in Lemon Creek bore distinct evidences of the contamination of that creek.

Turning now to the section which deals with chemical evidence of pollution I will refer to the Table No. 6 contained in page 59 of Exhibit No. 2, in which data showing free and albuminoid ammonia in sea water, sewage and clean land water are indicated. I believe this sheet—these may be considered for the purposes of this investi-

gation, convenient standards. Taking up table 7 in pages 59 and remembering the standards just referred to, I drew the following inferences:

From this table it appears that the water of the Bay contains about two and three quarter times as much free ammonia and about one and one half times as much albuminoid ammonia as pure sea water, and about six and one times as much free ammonia, and about the same amount of albuminoid ammonia as the Hudson River at Poughkeepsie.

Comparing this table with table 6, in which the standards
620 are set forth, it will be seen that the most polluted samples were taken from near the Battery, Robbins Reef, the Narrows and Coney Island. The figures in the last table excepting those relating to the first three samples are, as mentioned, taken from the report of the Commission on an Additional Water Supply for the City of New York.

Table 8 on page 60 of Exhibit No. 2, gave figures which were taken to show that the water of New York Bay as indicated in Table 7, contains nearly six times as much free ammonia and about the same amount of albuminoid ammonia as the water of the Hudson River between New York and Poughkeepsie.

There are various remarks then made concerning my inferences as to the effects of tides and currents and other purifying agencies, and—shall I deal with that subject here now?

Q. Yes, sir. We wish to know every fact and circumstance that aided you in reaching conclusions, and what they were?

A. One of the surprising results of the investigation as disclosed up to this point was the fact that the tide had little visable effect in eliminating the evidence of pollution.

It has always been supposed that the sewage and other organic impurities which drained into the Harbor were carried away by the vast quantity of pure water which came in from the sea, the Sound and the Hudson River. But it was here found that there was not a great deal of difference between the quality of the incoming and outgoing currents where the samples had been taken.

In some cases the currents flowing up the Bay from the sea were actually more polluted than those passing out on the ebb tide. It seemed that in spite of the great double movement, particles of sewage which were not destroyed or affected by the wind, passed back and forth indefinitely in the Bay and rivers in the neighborhood of their points of origin.

621 The action of the tide seemed rather to create a diffusion and distribution of the impurities than a mechanical replacing by pure water.

The question of the diffusion of the water of the Bay had such an important bearing on the question of the disposal of the sewage which entered it, that I thought it worth while to collect data to show the proportions of sea water and other water in the Bay under different circumstances. That information is the information concerning the salinity of the water referred to in the various tables

already mentioned by me, which chlorine is indicated as one of the ingredients found.

The intermingling of the salt and fresh water is well illustrated by the records of samples of water taken at various points in and about the harbor; for the purpose of this study, the water of the ocean beyond the range of fresh water, or, as I term it now, land water, necessarily may be taken as averaging about .018 parts of chlorine to a million parts of water, although it varies considerably in different parts of the sea. You may take the chlorine in Long Island Sound to be about .014 parts, of the Hudson at Poughkeepsie to be about 1.5 parts per million.

With these facts in mind, I examined the table No. 8 on page 62 of the Exhibit No. 2 with the following results:

The most striking fact exhibited by this table is the difference between the first five results and the last. The dates were widely separated and it is probable that the first lot of samples were taken for the Commission on an Addition Water Supply for New York City, were taken after heavy rainfalls, which produced freshets in the Hudson, Raritan and other rivers which empty into the lower New York Bay. Tables 9 and 10 probably show more accurately the average condition of saltness in the Lower Bay.

622 Referring to Table 9 on page 62 of Exhibit No. 2, I infer the first part of that table showed the effect of the fresh water which entered the Bay from the Raritan and Shrew-bury Rivers, while the last part showed the refreshening effect of the upward flow from the Narrows. The water in the lower Bay beyond these influences was probably about 75 per cent. sea water. The water in Gravesend Bay was found to be somewhat less salt than that along the Staten Island Shore on a day when the tide and water permit a fair comparison to be made between the two. The water of Gravesend Bay on the day when the samples reported in Table 10, page 63 of Exhibit No. 2 were collected, ranged from 70 to 77 per cent. sea water; the lower figures probably represent the effect of local dilution from Coney Island Creek and Upper New York Bay. On the whole the salinity was remarkably uniform, the greatest difference indicated in the table being only about 7 per cent.

Referring to Table 11 in page 64, Exhibit No. 2, I drew the following inferences:

It will be seen that the water of the upper Bay was composed of about one third to three quarters sea water, the rest being land water, the proportion evidently depending upon the point where the sample was taken, and usually to a less extent upon the stage of the tide. In fact, the action of the tide seemed to have affected it but little. But the harbor does not always contain more salt water than land water. As early as 1856, specific gravity determinations of the water in the vacinity of New York, were made by professor Henry Mitchell of the United States Coast and Geodetic Survey. In at least two of these results, one obtained near Pier 1 North River and the other from the Hudson at 152nd Street, the proportion of sea water was less than 20 per cent., according to Professor Mitchell's report. Sample collected March 3, 1903, for the Commission on an

Additional water Supply for New York City, showed that the data on that occasion will show more land water than sea water,
623 as a result of analyses taken every hour from 8 A. M. to 7 P. M. on March 3rd, 1903. The results obtained in Table 12, and my opinion at the present time, that besides showing how greatly the water in the vacinity of Manhattan may be diluted by the water of the Hudson River, Table 12 shows that the land water backed up the East River, making it fresher as far as Blackwells Island, at least. Beyond that point, the reduction in salinity produced by the Harlem River was plainly felt. Marked difference occurred in the amount of chlorine found in the samples taken at different hours at the same points as might be expected, where the salt and land water were meeting and mixing actively. At one hour the water at the Narrows was only about one quarter as salt, at the Battery only about one ninth as salt as the sea and at 129th Street and the Hudson, it contained only about .14 per cent. sea water.

Q. Doctor, I wanted to ask you a question?

A. Yes.

That is a typographical error there; that should be 14 per cent. There are other typographical errors in the report, one of which I have mentioned and the other is on page 68.

Q. Well, we will come to that in a moment, if you will correct that you go along.

A. Yes. I know of no others but those.

Q. Well, what is the correction there on page 66?

A. 14 per cent. sea water is correct. The last line of the first paragraph on page 66, table 13, was commented upon by me at the time, and I think the comment——

Mr. Riker (interrupting): Now, at the risk of interrupting the witness again, I further object to the use of this printed matter in addition to the reasons already given, for the reason that
624 it is not memoranda made by this witness, that it is a printed document, which the witness himself states in incorrect.

Mr. O'Sullivan: In reply to counsel I wish to say that it is not a memoranda, but is the full clearly expressed deductions, views, conclusions, inferences by the witnes- now on the stand from data which he himself collected from data which has been collected under his direction and since digested by him, and such corrections as the witness has made and called attention to were clearly typographical errors.

The Witness: My comments on Table 13, page 66 of Exhibit No. 2 are as follows:

The figures given in Table 13 shows thay the water at the Narrows was on this occasion 3/4ths as salt as the sea; at the Battery, nearly two thirds as salt; at Yonkers nearly one third as salt; and at Peekskill, 50 miles inland from the Narrows, about six per cent. as *slat* as sea water. The difference in the amount of chlorine which is the indicator of salinity found from hour to hour at any one station, comparatively slight. By careful examination of the

original data indicating that the mixing of sea and land water was not going on voluntarily in the vacinity of New York as was the case on the day when the samples were taken for Table 12.

In these studies it appears that the water of New York Bay was not composed of sea water and land water in any fixed portion; it changes with the season.

Mr. Riker: It appearing that the witness is reading from a document, counsel asks the right to examine him on the paper that he is reading from before he proceeds further.

Mr. O'Sullivan: All right, sir.

By Mr. Riker:

625 Q. You are reading from a printed pamphlet?

A. I am reading my own words.

Q. I ask you if you are reading from a printed pamphlet?

A. I am not, I am reading from the printed report of the New York Bay Pollution Commission.

Q. Have you compared that with your original?

A. I compared it at the time the report was issued.

Q. That particular document that you are reading was prepared at the time when your report was issued?

A. When—one that was printed from the same type.

Q. Have you compared this one that you are using with the one that you compared with your original.

A. I have not.

Mr. Riker: I object to his using it.

The Commissioner: Note the objection.

By Mr. O'Sullivan:

Q. I would like to ask you a question. Has that copy that you are now refreshing your memory from, ever been in any other possession than yours?

A. Not that I know.

Q. And where did you get that from, the printer?

A. What is that?

Q. Did you get it from the printer?

A. Yes, I did, at the time I was a member of the Pollution Commission.

Q. It has since been in your possession?

A. Yes, sir.

Mr. Riker: One question on that.

By Mr. Riker:

Q. When did you last see that pamphlet that you are using?

A. When did I last see it?

Q. Yes. When was it before today?

A. Yesterday.

Q. And before that when did you last see it?

A. Probably the day before, of the day before that.

Q. In whose possession was it?
A. My own possession.
Q. And before that when did you see it?
A. Probably the day before that.
626 Q. Well, don't you know?
A. No, for the reason that this report has reposed in my desk drawer and every time I opened my desk drawer, my eyes fell upon that report.
Q. That particular one?
A. That particular one.
Q. How did you identify it?
A. That is one copy.
Q. How did you identify it?
A. That is the only I have.
Q. Where you here when it was produced and offered in evidence?
A. This was not produced and offered in evidence, to my knowledge.
Q. Then you are not using Exhibit No. 2?
A. I am using my copy of the report of the New York Bay Pollution Commission dated March 31, 1905. It is, to my information, the last copy of that report to be had, under any circumstances and I have treasured it as a personal possession of considerable value, because of my connection with the Pollution Commission.

Mr. O'Sullivan: And counsel for complainants now offers to counsel for defendants the copy marked complainants' Exhibit No. 2 for the purposes of comparison with any part and all parts of the duplicate copy from which the witness is refreshing his memory.
Mr. Riker: Counsel for the defendants respectfully declines to make such an extensive comparison, not feeling called upon to do so.
Mr. O'Sullivan: The offer is not made towards a view of imposing a duty upon counsel for defense, but to dissipate the suspicions or apprehensions in the mind of counsel for the defense and is a full voluntary offer to *convenience* counsel for the defence.

You may proceed, Doctor.
627 The Witness: In the lower Bay it has been found to range from about 20% to 100% sea water, according to the location of the point with reference to local sources of dilution, and the amount of land water coming down the various large rivers. The fair average for the Lower Bay under ordinary conditions of weather and beyond the reach of local dilution, is about 75%. The water of the Narrows has been found to vary from 43% to 77% sea water, the majority of samples averaging about 65% sea water. At the Battery the samples have ranges from 15% to 69% sea water with the average in this vacinity under what appeared to be fairly normal conditions of about 45%. The lower Hudson is the scene of the widest variations in the proportion of salt. In the tables mentioned by me in this case, it is shown that the Hudson at Spuyten

Duyvil has ranged from an hourly average of 5%, (and I call attention to a typographical error)——

Q. (Interrupting.) In complainants' Exhibit No. 2, which instead of being .5 per cent. Should read 5%.

A. (Continuing.) To an hourly average of 44 per cent. sea water for a whole day. There may be as much salt sometimes at Croton Point as there is at others at the Battery, 33 miles away. In fact, the upper limit of brackish water may be found anywhere between Yonkers and Poughkeepsie. The cause of these differences is to be found largely in the rain fall, for this furnishes the land water which flows down the Hudson and tempers the sea water.

In the spring when the discharge of the river is at its height, large quantities of land water force the sea water downwards toward the sea; in the late summer when the rain is slight and in winter when the tributary streams are frozen, the salt water creeps up the Hudson for a surprising distance. Between Yonkers and
628 West Point the limit of salt is continually fluctuating, every tide affects it so. As the wind may raise the water of the Bay more than the tide does, every storm has an appreciable effect in advancing or retarding the line. The flow of the currents through the Narrows, East River and Hudson seems to have little influence upon the saltness of the water, even in these vicinities except at seasons that the Hudson is discharging large quantities of land water, when the action of the tides produces a mark effect.

Mr. O'Sullivan: One moment, Doctor, I think Mr. Commissioner, we ought to cease here. I have been informed that the Finance Committee needs to use this room very soon; they will be here a little after one o'clock. I understand that the board of Aldermen will be in full session here and that they use this room today. This is the only day that they use it in the week. So I am afraid that I will have to ask for an adjournment until tomorrow morning, sir.

Mr. Riker: I would like to go on, Mr. Commissioner. Isn't it possible to find some other place where we can hold this session?

The Commissioner: We will adjourn until 10:30 tomorrow morning.

Adjourned to September 20, 1911 at 10:30 a. m.

629 Supreme Court of the United States, September Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK,
September 20th, 1911—10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York; William A. McQuaid, Esq., Deputy Attorney General, and

William J. O'Sullivan, Special Counsel for the People of the State of New York, Complainants.

Edmund Wilson, Esq., Attorney General of the State of New Jersey; Robert H. McCarter, Esq., of counsel for the State of New Jersey; Joseph Coult, Esq., and Adrian Riker, Esq., of counsel for the Passaic Valley Sewerage Commission, Defendants.

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Mr. O'Sullivan: The witness who was on the stand, may it please the Commissioner, notified me yesterday that he has been under a physician's care. I do not know whether he may come here later or not, but I have another witness that I will put on, who is a member of the same commission, unless there is objection to it.

Mr. Riker: No.

Professor OLIN H. LANDRETH, a witness on behalf of complainants, being duly sworn by the Commissioner, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. What is your full name, Professor?

A. Olin H. Landreth.

Q. What is your profession, sir?

A. I am a Civil engineer.

Q. Are you connected with any of our teaching institutions?

A. Yes, sir, connected with the Engineering School of Union College Schenectady, New York.

Q. When did you graduate as an Engineer?

A. In the year 1876.

Q. Have you been in continuous practice of your profession since?

A. Continuous as far as my duties as a professor of Engineering during most of that time would permit, I have given all my time outside of college work to the professional engineering practice.

Q. Were you a member of the New York Bay Pollution Commission?

A. I was.

Q. During what years?

A. During the years 1903 to 1906.

Q. Is that the full life of the commission?

A. It was; but I should say the commission was established,

631 not at the beginning of 1903, but in the early months of the year, and closed its duties and the life of the commission terminated about the middle of the year 1906.

Q. By what authority was the New York Bay Pollution Commission established, and, if you know, state by whom the members were appointed?

Mr. Riker: Now, I object to encumbering the record with repetition of this testimony; it is in three times already at least.

The Commissioner: Note the objection.

Mr. O'Sullivan: You may answer.

The Witness: The commission was established under legislative authority of the State of New York, represented by an Act forming

Chapter 935 of the Laws of the State of New York, for the year 1903. The purposes are set forth in the Act as follows:

The Governor——

Mr. Riker: I object to his stating the legal purport of the Legislative Act. The Act speaks for itself, and expresses its purport and is the best evidence.

Mr. O'Sullivan: I propose to spread that Act on the Record.

The Commissioner: Note the objection.

The Witness: The Act is as follows:

"The Governor is hereby authorized to appoint a commission consisting of five members——

Mr. Riker (interrupting): I object now to this witness reading the Act, as that is not a proper way to prove a Legislative Act, if admissible.

Q. Well, what are you reading the Act from, Professor?

A. I am reading the Act from the report of the New York Bay Pollution Commission submitted to the Governor of New York on March 31, 1905. The Act is a true copy of the Act as printed
632 in the Legislative Laws as compared by me.

Mr. Riker: I now object to it on the ground that the witness has disclosed the fact that he has not even an official copy of the Act before him.

The Commissioner: Note the objection.

Q. Is that report known as Senate Document No. 39, May 1st, 1905?

A. It is.

Q. I now show you Complainants' Exhibit No. 2, being Senate Document No 39, State of New York, dated May 1st, 1905, being a report of the New York Bay Pollution Commission to Frank Whalen Higgins, Governor of the State, and ask you to find the Act creating the commission in that Exhibit?

A. Yes, I find the Act as in this report.

Q. Have you a copy of that report?

A. I have.

Q. Where did you get that copy of that Complainants' Exhibit No. 2?

A. I received it from the State Printer.

Q. Did you read any of the proof sheets prior to receiving that copy?

A. Yes, sir, all that related to my work and many parts of the remaining portion of the report.

Q. Have you that copy with you now?

A. I have.

Q. Have you compared it with Complainants' Exhibit No. 2?

A. I have.

Mr. Riker: Is he going to use it?

Mr. O'Sullivan: I am going to ask him to read that act.

By Mr. Riker:

Q. When did you compare it, Professor Landreth?

A. I compared the Act——

Q. No, I am asking you when you compared your alleged copy with Exhibit No. 2?

A. Well, since the Exhibit No. 2 was introduced in this case; I cannot give you just the day.

Q. You examined it and compared it at some other time than now?

A. Yes.

633 Q. And in what way did you examine it and compare it?

A. By going through the report at—page to page and noticing various *pints* by comparison, to ascertain whether or not there was any deviation between the two reports and found none whatever.

Q. What points did you compare?

A. Very many points throughout the entire book from cover to cover.

Q. Did you have some one read you the Exhibit No. 2, and did you, while it was being read, compare it verbally?

A. Yes, in part, but not all.

Q. How much of it did you do?

A. Why, I could not say; quite a material part.

Q. You compared the act of the Legislature?

A. I did.

Q. Word for word?

A. Word for word.

Q. Had it read over to you and compared it as it was by reading?

A. I wish to say that I compared the Act of the Legislature in my copy with the published Acts of the Legislature.

Q. I was not asking you that; I asked you whether you compared your copy with Exhibit No. 2, so far as the Act of the Legislature is concerned?

A. I did, but I did not read it over word for word.

By Mr. O'Sullivan:

Q. Read from Complainant's Exhibit No. 2 the Act of the Legislature?

Mr. Riker: I now object; first on the ground that this witness is not even sure that that is a copy of the Act; it is a copy of the alleged copy of the Act contained in Exhibit No. —. Secondly on the ground that Complainants' Exhibit No. 2 is an exhibit in the cause it speaks for *himself* and does not need to be spread on

634 the record. Third, because if the Act is relevant and material, and if admissible should be proved in the proper legal manner.

The Commissioner: Note the objection.

Mr. O'Sullivan: I would like to say in answer to that, that counsel has objected to acceptation of complainants' Exhibit No. 2, and if

he will withdraw his objection, I will withdraw my question asking this witness to read that act.

Mr. Riker: In reply to that I can only say that counsel for Complainants is not under my guidance at all in this matter and counsel can do as he pleases about offering his exhibits, but I simply desired to have noted on the record such objections as I think are relevant to the offers.

Mr. O'Sullivan: Counsel for complainants regards counsel for defendants' answer as making it absolutely necessary to spread this act upon the record.

Q. Professor Landreth, did I understand you to say, that you compared the act as printed in your copy with the act as found in this Statute book?

A. You did.

Q. Then will you read from your copy?

Mr. Riker: Now, I desire to examine him on this offer.

By Mr. Riker:

Q. When did you make that comparison?

A. That comparison was made soon after the report came from the printer.

Q. Why did you make the comparison?

A. In order to see if it was a true and faithful copy of the Legislative Law.

Q. Was that part of your duty as a member of the Commission?

A. It was a part of my implied duty to be sure that the report as put out was correct.

Q. Where did you get the original with which you made your comparison?

A. At the State Library in Albany, New York.

635 Q. Who made the comparison with you?

A. My assistant at that time.

Q. What was his name?

A. I do not remember which one it was.

Mr. Riker: That is all.

By Mr. O'Sullivan:

Q. You may read that act calling you into being.

Mr. Riker: Can't we save time by spreading it on the record without his going through the motions of reading it?

Mr. O'Sullivan: No, sir; you have made it necessary, absolutely necessary.

Mr. Riker: What I want to do is get on with this cause now.

Mr. O'Sullivan: We will get on in a very orderly way. We want to show that this is a properly constituted commission and that it kept within the lines of its instruction and adhered to the object of its creation.

The Witness: Chapter 539, entitled "An Act to authorize the appointment by the governor of a commission to investigate certain

threatened pollution of the waters of New York Bay, and making an appropriation for the expenses of such commission."

Q. When did that become a law, Professor?

A. That became a law on May 11th 1903, with the approval of the Governor.

The Act reads as follows:

"The People of the State of New York represented in Senate and Assembly do *and act* as follows:

Section 1. The Governor is hereby authorized to appoint a commission consisting of five members to investigate the alleged contemplated construction of a sewer *of* sewers in the State of
636 New Jersey and the discharge therefrom of sewage into the waters of New York Bay. The members of such commission shall receive no compensation for their services, but shall be entitled to their actual necessary traveling and other expenses incurred in the performance of their duties.

Such commission shall organize by the selection of one of its members, as Chairman and another as Secretary.

Section 2. Such commission shall confer with the authorities of the State of New Jersey, take the testimony of witnesses if necessary, and otherwise make such investigations as it may deem advisable, to determine the character of such threatened pollution, if any, and the means necessary to effectually prevent the same, in order to protect the health of the people of this State.

Section 3. Each member of such commission shall have the power to administer oaths, and the commission shall have power to subpœna witnesses and take testimony, and in addition, shall have all the powers of legislative committees as provided by Article III of the Legislative Law.

On or about February first, 1904, the commission shall report to the Governor the results of its investigations, together with such recommendations as to needed legislation or other acts on the part of the State to prevent the pollution of the waters of New York Bay from causes specified in this Act, as it may deem advisable.

Section 4. The sum of two thousand dollars, or so much thereof as may be necessary, is hereby appropriated out of any moneys in the Treasury not otherwise appropriated, for the purposes of this Act, to be paid by the Treasurer, on the warrant of the Comptroller on the order of the Chairman of such commission.

Section 5. This Act shall take effect immediately."

Q. Was that act certified by the Secretary of State?

637 Mr. Riker: I object on the ground that this witness has not shown that he has any knowledge of certification by the Secretary of State and is not the custodian of the record.

The Commissioner: Note the objection.

Mr. Riker: Has not been shown to be the custodian of the records.

The Witness: The Act was compared with the original law by

Secretary of State John F. O'Brien, and his certificate is attached to the copy of the law published in this report.

Q. Did the commission in accordance with the direction of that act organize?

Mr. Riker: One moment. I object on the ground that the proceedings of the Commission are properly shown by the testimony of the minutes and of their Secretary or President.

The Witness: Under this Act the Governor made the appointments of the commission, and those members met and organized as a commission, and elected their officers. The President of the commission was Dr. Daniel Lewis, at that time State Commissioner of Health at New York; the Secretary elected was Mr. Louis L. Tribus.

Mr. Riker: I object now to this testimony and move to strike it out on the ground that it is not relevant and it is not responsive to any question.

The Commissioner: Note the objection.

Mr. O'Sullivan: You may proceed, Professor.

The Witness: Mr. Louis L. Tribus, at that time Consulting Engineer and Commissioner of Public Works, Burough of Richmond, City of New York.

Q. Did Mr. Lewis hold any official capacity at that time?

A. Yes, sir. He was then State Commissioner of Health of New York.

638 Q. Were you ever connected with the State Department of Health?

A. Yes, sir. I was for ten years Consulting Engineer to the State Board of Health, and when that board was changed to a department, I was appointed as Consulting Engineer, and remained as such for a total period of a little over ten years.

Q. Did you compile any data that is included in this report made by the New York Bay Pollution Commission to Governor Higgins?

A. Yes, sir. The Commission undertook its activities in two different manners. Certain acts and duties were performed by the commission at large transacted at meetings and by committees of the association at large. Another division of the duties was performed by individual members to whom had been assigned by the commission specifies topics on which to make investigations and submit reports.

Mr. Riker: I move to strike out this nar-ative evidence and testimony on the ground it is not responsive to any question and that it — incompetent and irrelevant.

The Commissioner: Note the objection.

Mr. O'Sullivan: You may proceed.

The Witness: And under that latter division of the work of the commission, I was assigned two topics; *a* and *b*. A. The Legislative and documentary history of the Passaic Valley Sewerage project, and B, the matter of ocean disposal of sewage and other wastes.

Mr. Riker: I shall now move to strike out this last testimony on the same grounds that his instructions are not material to this issue in this suit.

The Commissioner: Note the objection.

By Mr. O'Sullivan:

Q. For what purpose or purposes was the commission established?

Mr. Riker: I object to the question on the ground that the
639 Act itself discloses the purposes and is the best evidence. It does not appear that the Act cannot be legally proven.

The Commissioner: Note the objection.

A. The Commission was established in order to investigate what, at that time, was a very serious problem in the eastern part of New York State relating to the threatened pollution of the waters of New York Bay, by a proposed trunk sewer draining protions of the Passaic Valley. The attention of the State Commissioner of Health was drawn to the matter officially and after discussion in the department the matter was taken up by the Commissioner with Governor Odell and certain of the other State officials. As a result of that deliberation, the Act which I have just quoted was introduced and passed at the session of the Legislature of 1903, the purpose being to, in the first instance, investigate the facts as to the alleged pollution, and second, its probable cause on the waters of New York Bay, and it found to be serious menace to the purity of these waters, then to devise what means were available to prevent the pollution. The chief idea being had that primarily the State should so far as possible, co-operate with New Jersey in a way, to study the question and arrive at a means of avoiding whatever danger investigation might show was imminent. In fact, the first duty imposed by the Act was to confer with the authorities of the State of New Jersey, relative to the threatened poilution arising from the contemplated sewer.

Q. Proceeding on those lines, what did the commission do?

Mr. Riker: Objected to on the ground that it is immaterial what the commission did with reference to the issue in this suit.

The Commissioner: Note the objection.

640 The Witness: The commission at its first meeting arranged for a communication to be sent to the Governor of New Jersey, calling his attention to the law of New York which had been passed, and expressing the desire of the New York authorities to investigate the question in conjunction with New Jersey, and requesting that the Governor indicate what officials or what body already existing or to be appointed would be proper to communicate with, and to negotiate with in the matter of the investigations. Later the commission held one formal conference with the officials of the Passaic Valley Sewerage Commission and I believe one formal session with the same commission. But we were unable to undertake together any systematic study of the situation in conjunction with the New Jersey officials.

Q. Was part of the function of the commission to take the testimony of witnesses for any purpose?

Mr. Riker: Objected to on the ground that the question is leading, it is immaterial.

The Commissioner: Note the objection.

Mr. O'Sullivan: Withdraw the question.

Q. What were the other functions of the commission?

Mr. Riker: Objected to on the ground that the functions of this commission have nothing to do with the issue in this cause, and that the question calls for an immaterial and irrelevant answer.

The Commissioner: Note the objection.

The Witness: To take the testimony of witnesses for the purposes of deducing information and expert opinion concerning the matter of the sewer and the threatened pollution of New York Bay, and to make such investigation as the commission might deem advisable, in order to determine the character of such threatened pol-
641 lution, if any, and the means necessary to effectually prevent the same.

Mr. Riker: The witness having read from a document, I would like to question the witness.

Mr. O'Sullivan: All right.

By Mr. Riker:

Q. What was that paper you read from, Professor?

A. That is a statement of some notes I made myself as to the purposes of the Commission drawn from the Act of the commission.

By Mr. O'Sullivan:

Q. Did the commission undertake any other work imposed upon it by the Act?

Mr. Riker: Objected to on the ground that it is immaterial and irrelevant what the commission did, and especially because the question is indefinite and not directed to any issue in this suit.

The Commissioner: Note the objection.

Mr. O'Sullivan: I press the question, may it please the Commissioner, for the reason that this commission is specially organized to investigate the conditions of the harbor waters and discover whether or not this threatened pollution would not be followed by serious consequences, if the enterprise was successful on the part of the Passaic Valley Sewerage Commission, and it incumbent upon the Complaints to show that the commission followed the instructions laid down for it by our Legislature, and in what particulars it conformed with these instructions.

Mr. Riker: The objection is pressed on the ground that the issue is whether or not the construction of the proposed sewer threatens a nuisance, and that with this issue the proceedings of a partisan, ex parte commission has no concern.

642 Mr. O'Sullivan: I would like to correct defendant's counsel, in that our objection is not so much to the construction of the sewer to operation and dangerous results from the pollution.

Read the question.
The question was read by the stenographer.

The Witness: Under the Act it did investigate the alleged contemplated construction of the Passaic Valley Sewers and the discharge therefrom of sewage into the waters of New York Bay.
Q. Did the commission hold meetings?
A. It did.
Q. Examine witnesses?
A. Yes.
Q. Conduct investigations of a scientific character?
A. It did.

Mr. Riker: I object to the question on the ground that the court should be the judge as to whether the investigations were scientific and that the answer forms a conclusion.
Q. Professor Landreth, where you assigned to any particular line of investigation upon which you were requested to report to the Commission?

Mr. Riker: Objected to on the ground that this question has already been asked and answered under objection. The same objection is now made.

The Witness: I was.

By Mr. O'Sullivan:

Q. What topics were assigned to you to investigate?

Mr. Riker: Objected to on the same grounds that the question is immaterial and irrelevant.

The Witness: The topics assigned to me comprise two divisions, *a*, a summary in outline of the history, laws, reports and plans of the Passaic Valley Sewerage project; *b*, Ocean disposal as a possible solution of the sewerage problem for the entire Metropolitan
643 District, regardless of State boundaries.
Q. Taking the first topic, Professor what documents did you examine to ascertain the facts or to arrive at the conclusions which you finally furnished and reported to the Commission?
A. Under subdivision A, I ascertained the following facts, and examined the following documents, bearing on the history of the Passaic Valley project up to the time of making my report:
The Legislature of New Jersey on February 26th,——
Mr. Riker (interrupting): One moment,—I desire to enter here an objection to the witness detailing in nar-ative form his investigation of official documents,—it is now made clear that is his intention,—on the ground that official documents in records should be proved as the law directs and not by the testimony of a witness. He is not in a position to prove the documents in a legal way.
The Commissioner: Note the objection.
Mr. O'Sullivan: You may proceed.

The Witness: The Legislature of New Jersey, on February 26th, 1896, enacted a law, being Chapter 7 of the Laws of 1896 entitled

"An Act for the consideration of a joint system of sewage disposal for the Valley of the Passaic River and prevention for the pollution thereof.

Mr. Riker: Now, I observe that the witness is reading from a paper and I should like the privilege of asking the witness some questions.

Mr. O'Sullivan: All right.

By Mr. Riker:

Q. What is the paper you are reading from, Doctor?

A. The paper I am reading from is an abstract of my in-
644 vestigations into the documentary history and development of the Passaic Valley project.

Q. And does it contain alleged extracts from those documents?

A. No, sir; it gives no extracts; it gives simply my own synopsis of the general purpose and results of those documents.

Q. That is your interpretation of those official documents isn't it?

A. It is the interpretation which I drew from the documents themselves.

Q. Exactly. Are you a lawyer?

A. No, sir.

Mr. Riker: I object on the ground that this witness has shown himself to be incompetent to extract official legal documents, and the documents themselves should be produced and proven, so that they may disclose to the Court their legal purport.

Mr. O'Sullivan: The question is pressed for the reason that Complainants desire to show every fact and circumstance, the law and the scientific investigations that influence and determine the report furnished to the Governor, of this State by this commission, and at this stage is particularly inquiring into such facts and circumstances as guided the functional activity of the witness now on the stand.

Mr. Riker: The objection is pressed for the reason that the record is now being loaded up in the opinion of counsel with a mass of irrelevant material which, if it is ever made competent, is already contained in Exhibit No. 2, being an offer on behalf of Complainants.

Mr. O'Sullivan: And which Complainants desire to ask the Commissioner's attention to, and has been objected to by counsel, for the defendants.

Mr. Riker: And is still objected to on the ground it has
645 not been proved and is not in any sense a legal piece of evidence.

Mr. O'Sullivan: Which makes it still more incumbent upon Complainant's Counsel to furnish all evidence of the facts therein. You may proceed, Professor.

The Witness: This law provided for the appointment by the Governor of the State of New Jersey of three citizens as a Commission to consider the subject of the pollution of the Passaic River and of the general system of sewage disposal for the relief of the Passaic Valley. These citizens were given power to employ engineer-

ing and other assistance and to report to the Legislature their conclusions, with maps, plans, methods of carrying out the work, and estimates of costs, and their recommendations as to the methods of apportioning the cost and the sum of $10,000 was appropriated to defray expenses of this investigation. A copy of this Act is given on page 5 of the published report of the commission, dated February 26th, 1897.

Q. The published report of which commission?

A. Of the New Jersey commission, appointed under the Act just mentioned. Under the Act the Governor of New Jersey appointed on April 21st, 1896, as such commissioners, Messrs Ellis J. Marsh, M. D.; H. C. H. Harold, M. D. and William T. Hunt. The commission organized with the following officials and advisers, E. J. Marsh, M. D., Treasurer; W. B. Scott, Secretary, Joseph Cole, Counsel, and Alphonse Fteley, Consulting Engineer, C. E. A. Jacobson, Engineer: Herbert B. Baldwin, Chemist, and Richard M. Connolly, Bacteriologist.

On February 26th, 1897, the commission submitted a report containing the individual reports of the Engineers, Secretary, Chemist and Bacteriologist together with general conclusions and rec-
646 ommendations of the Commission, including the recommended draft of a proposed law entitled "An Act providing for the purification of the rivers and streams of water within this State and to prevent the pollution of the same.

Mr. Riker: Now, Mr. Commissioner, I wish to put on the record the statement that in as much as the witness over my objection is proceeding to put statements in narrative form not responsive to questions by counsel, which can be objected to, dealing with the matters that are properly subject to objections, I shall have to reserve the right to put a general objection and motion to strike out at the end of the nar-ative.

The Commissioner: Note the statement of counsel for the defendants.

Mr. O'Sullivan: You may proceed.

The Witness: The next document examined was An Act enacted by the Legislature of New Jersey on March 24th, 1897, forming Chapter 35 of the Laws of 1897, to prevent the wilful pollution of the Passaic River and tributaries thereto above the Great Falls of the Passaic River at Paterson. Owing to a strong opposition to the terms of the draft of the bill recommended by the Commission in 1896, the bill was not brought up for passage but in place thereof an act was passed authorizing a committee of the members of the Legislature to study the subject and to report at the next session what should be done in the matter. This Legislative Committee comprised Senators, Robert Williams and W. M. Johnson and Assemblyman T. C. Wildman.

During 1897, this committee held public meetings and listened to arguments for and against the proposed Legislation. In the spring of 1896 the Committee reported as to the result of its labors.

Q. 1896 or 1898?

647 A. 1898, I should say. The Committee reported as to the result of its labor that the whole matter should be studied again by a new commission, and presented a bill providing for a commission of eight members, three of whom would be members of the original commission of 1896. This bill was passed and Governor Voorhis on August 3rd, 1898, appointed the following as commissioners: Mr. William T. Hunt; Doctor H. C. H. Harold; Doctor E. J. Marsh; and Hon. John Hinchliffe; Doctor James C. Exton; Hon. Charles W. Fuller; Hon. Charles F. Harrington; and Mr. William Kent.

The Legislature of New Jersey next, on March 24th, 1899, enacted a law forming Chapter 210 of the Laws of 1899, entitled: "An Act to prevent the pollution of the waters of this State by the appointment of a State Sewerage Commission, authorizing the creation of sewerage districts and district sewerage boards and prescribing, defining and regulating the powers and duties of such commission and such board." This Act provided for the appointment by the Governor of five citizens of the State to compose the State Sewerage Commission, the duties of which commission were to investigate the various methods of sewage disposal and to investigate the complaint of pollution of the waters of the State, and to advise as to the best methods of sewage disposal in order to prevent such pollution, and to pass on and approve or disapprove of all plans for sewage disposal into waters of the State before such system should lawfully be built. The sum of $5,000 was appropriated to enable the commission to carry on the provisions of the Act.

The Act also provided for the formation of sewerage districts and for the appointment of sewerage boards, each board to comprise two members of each municipality, within the district, to be appointed by the governing body of each such municipality, and one member to be appointed by the State Sewerage Commission. These
648 district boards were to be considered as corporate bodies and were given powers to investigate, design, construct, maintain and operate systems of sewerage and drainage, and systems of sewage disposal works or both, and were given the power to condemn and appropriate lands and to issue bonds.

This Act was re-enacted in a somewhat amended form by the Legislature of 1900, forming Chapter 72 of the Laws of 1900.

It is to be noted that the functions of this State Sewerage Commission were general, and were not confined to the Passaic Valley.

The first Commissioners appointed under this act were as follows: Charles F. Harrington; John Hinchliffe; William T. Hunt; Charles W. Fuller and David L. Wallace.

The State Sewerage Commission above provided submitted several annual reports, among them the following: The Annual reports of the State Sewerage Commission of 1899 forms document No. 48 of Volume 5 of the Legislative documents for the year 1899. As no appropriation was made for the expenses of the commission no engineering investigations were made during the year, but the commission gathered a large amount of information concerning sewage of the cities and villages of the State, on circular blanks issued by the Commission.

The commission recommended to the Legislature that additional powers be given the commission by which they might complete the abatement of existing pollution, and also recommended that authority be given to two or more municipalities to co-operate in providing sewage disposal.

The Commission also submitted a draft of a bill amending the existing law, Chapter 210.

Mr. Riker: That is New Jersey, isn't it?

The Witness: Yes.

649 Of 1899 so as to provide the above and several other proposed features.

The Annual report of the State Sewerage Commission for 1900 forms document No. 49 of Volume 5 of the Legislative documents for 1900.

The Legislature in 1900 amended the original law establishing a State Sewerage Commission and re-enacted it as Chapter 72 of the Laws of 1900 on June 4th, 1900, the State Sewerage Commission adopted a resolution as follows:

"Resolved that under authority of chapter 72 of the Laws of 1900, that prior to June 1st, 1904, the municipalities of Paterson, Passaic, Rutherford, Newark, Orange, East Orange, Malden, and Blanford, Glenridge, Kearney, Harrison and East Newark, now polluting the waters of Passaic River with sewage, must cease to pollute the waters of said river and make such disposal of sewage and other polluting matters of such municipalities as shall be approved by this commission.

The annual report of the State Sewerage Commission for 1900 comprises document No. 49 of Volume 5 of Legislative documents for 1900. The Legislature of 1900 amended the original law establishing the State Sewerage Commission and re-enacted it as Chapter 72 of the Laws of 1900. On June 4th, 1900, the State Sewerage Commission adopted a resolution as follows: which is the formal presentation of the results just referred to:

During the year the Commissioners received and considered a number of plans of projects and passed on plans for sewerage and sewage disposal for a number of municipalities in the State. The subject of sewage disposal in Great Britain and France was investigated by Chairman William T. Hunt, who inspected and reported on the systems in use in London, Parris, Leeds, Manchester,

650 Glasgow, and Edinborough. No extensive engineering investigations were made by the Commission in the year owing to lack of funds. The annual report of the State Sewerage Commission for the year 1901 forms document 49, Volume 5 of Legislative documents of 1901.

Governor Voorhis transferred to the commission $8,000 from his emergency fund, which enabled the commission to undertake some engineering work. This work was to be confined to the Passaic Valley problem, as the most important single sewerage problem in the State, and consisted in the making of surveys and plans for a system of intercepting sewers extending from Paterson along the Passaic River to Newark Bay, with plans for sewage disposal.

Part of this work was undertaken by Messrs. Collin R. Wise, Robert M. Watson and William Ferguson, Engineers and the remainder by Mr. James Owen C. E. and reports were submitted from these two divisions of the engineering work.

These reports with the maps and plans accompanying them, were then submitted to a number of consulting engineers comprising Messrs. Rudolph Hering, J. J. R. Croes and William M. Brown, who examined and reported not only on the plans as already submitted, but also on alternate features. The conclusions on the part of the consulting engineers were that the most efficient and economical system of disposal for the Passaic Valley from Paterson to Newark Bay, was a system of intercepting sewers, without sewage treatment by which the entire sewage of the municipalities along the Valley should be brought to New York Bay.

The Commission also submitted a number of technical questions regarding the sewage disposal to Mr. H. W. Clark, Chemist of the Massachusetts State Board of Health, and the report contains the answers of Mr. Clark to these questions.

651 In addition to the Passaic Valley investigations, the commission also considered the cases of a number of municipalities and streams throughout the State and ordered a number of municipalities to cease the pollution of certain streams at certain stipulated dates.

The Commission also approved during the year plans for sewerage and sewage disposal for a number of municipalities in this State.

The annual report of the State Sewerage Commission for the year 1902, forms document No. 33 of Volume 3 of Legislative documents for the year 1902, submitted to the Legislature of 1903. The Legislature of 1902 having passed an act forming Chapter 48 of the Laws of 1902 establishing a separate sewer district for the Passaic Valley and creating a commission therefor.

The State Commission devoted its energies to other portions of the State placing the services of its members and the official records and material at the disposal, however, of the Passaic Valley Sewerage Commission.

The Legislature of 1902, passed an Act, Chapter 49 of the Laws of 1902, approved March 27th, 1902, providing that the Legislature might create and incorporate sewerage and drainage districts——

Mr. Riker (interrupting): Pardon me, Doctor, but I observe that the witness is no longer confining himself to his typewritten notes, but is reading from another document. I would like to ask him what is the instrument that he is reading from?

The Witness: I am now reading from the published report of the New York Bay Pollution Commission, dated March 31st, 1905, which forms Exhibit No. 2, in this case.

By Mr. Riker:

652 Q. From what you believe to be a copy of Exhibit No. 2 in this case?

A. Yes, from what I find by comparison to be a copy.

Mr. Riker: I object to its use and to his reading from and spreading upon the minutes or record in this case such documents, in as much as if it is relevant and material it is already included in and a part of Exhibit No. 2.

The Commissioner: Note the objection.

By Mr. O'Sullivan:

Q. In whose language were these facts expressed, that you are consulting now in Complainants' Exhibit No. 2?

A. They are expressed in my own language, since I am reading from that portion of this report which comprises my own report to the commission, and the commission's report to the Governor.

Mr. Riker: My objection, if the Commissioner pleases, is directed to the cumbering of this record with a mass of matter which is already in, and is immaterial and irrelevant, and if it is not material and relevant cannot be made part of this record.

The Commissioner: Note the objection.

The Witness (continuing reading): * * * "And providing for the appointment by the Governor of boards of Sewerage Commissioners of five residents of each section."

The Legislature of 1902 passed an act, being Chapter 48 of the Laws of 1902 entitled "An Act to create a sewerage district to be called the Passaic Valley Sewerage District."

The Governor appointed under these acts the following gentlemen to comprise the Passaic Valley Sewerage Commission: Messrs. J. A. Lebkeucher, John Hinchliffe, Francis Child; Peter Haupt; and William McKenzie.

This commission organized on April 22nd, 1902, by the selection of Mr. J. A. Lebkuecher, as Chairman and Mr. John G.
653 Gibson, as Clerk. On August 18th, the Commission appointed Mr. Rudolph Hering of New York as Chief Engineer.

This commission submitted its first annual report to the Legislature on January 23, 1903. This report contained beside the general report of the commission, the report of the Chief Engineer Mr. Rudolph Hering, and also a draft of a proposed bill, which would more thoroughly provide for the carrying out of the sewage improvement recommended by the commission.

The report of Chief Engineer Hering describes his surveys, examinations and conclusions on the study of two alternate general plans of improvement, namely, first a system of intercepting sewers extending from Paterson to Newark Bay, by which the sewage of this portion of the Valley should be brought to and discharged into the waters of the Upper New York Bay without purification, and, second, a system of intercepting sewers, but in place of crude disposal into New York Bay, the use of one or more purification plants in which the sewage should be treated and the purified effluent discharged into the Passaic River or Newark Bay.

Mr. Hering's conclusions favored the adoption of the former method. This system, which is the one proposed for consideration, comprised a main intercepting sewer extending from a point near the Great Falls of the Passaic, in the City of Paterson along the right and westerly bank of the Passaic River to a point in the City of Newark, where it leaves the river and passes southeasterly through the City across the salt meadows, to a point on the shore of Newark Bay about opposite West Bergen Point, where a main pumping station was to be located.

Down to the site of the pumping station, this was to be a gravity sewer, and two auxiliary pumping stations were proposed one at Wallington, and one at Lynhurst, with sewage water low
654 level sewers on the left bank of the Passaic River to be pumped across the river and into the main intercepting sewer.

The pump station on Newark Bay was to force the sewage through two six feet in diameter steel force mains under Newark Bay, and up into the gravity sewer on the easterly shore of Newark Bay, in Jersey City, near the Morris and Essex Canal.

This gravity sewer, 13 feet in diameter then leads southeasterly along the Canal to a point jutting out into upper New York Bay near Panrapo, where the sewer discharges to the 8 feet steel pipe laid under New York Bay, to a point about three quarters of a mile northeast of Robbins Reef Light in a depth of about 40 feet of water below mean low tide.

This report also contained the draft of the bill which the commission recommended to the Legislature as being necessary to carry out the improvements proposed.

This bill in a somewhat modified form was enacted on April 27th, 1903. This Act provides for the full powers of the Commission and for the procedure to be followed in executing the sewer improvement under consideration.

One of the provisions of this Act was that before any work should be undertaken or obligations incurred, the Passaic Valley District Sewerage Commission would investigate whether the proposed discharge of sewage into New York Bay is likely to pollute the waters of said Bay to such an extent or in such a degree as to cause a nuisance to persons or property within the State of New York, and requires that the result of such investigation should be presented to the Governor, with the opinion of the Commission thereon, and the reason for their opinion. Thereupon that the same should be considered by the Governor and the Attorney General and that no work or further proceedings be taken unless the Attorney Gen-
eral should in writing advise that no cause of action, either
655 for damages or an injunction would arise in favor of the State of New York or any of its inhabitants by reason of such discharge of sewage into the waters of New York Bay.

Pursuant to the requirements of the law above quoted, The Passaic Valley District Sewerage Commission investigated the subject and reported as their opinion, that the discharge of sewage from the proposed Passaic Valley sewer would not pollute the waters of New York Bay to such extent or to such degree as to cause a

nuisance to persons or property within the State of New York. The commission submitted as a warrant for this conclusion, copies of the original notes of General Henry M. Roger; George S. Green, Jr.; E. W. Harrison; O. H. Tippmann; William Barclay Parsons and Allen M. Spooner.

Governor Murphy having examined the Special Report submitted by the Passaic Valley District Sewerage Commission, referred the same to Attorney General McCarter for his legal opinion. The Attorney General having examined the report and having further investigated the case advised the Governor that he found no legal objection to the building of the trunk sewer proposed, and that in his opinion there would be no legal objection from the authorities of New York.

Thereupon Governor Murphy authorized the Sewer Commissioners to proceed to the construction of the improvements contemplated.

The Acts of 1902 and 1903 were attacked by writs of certiorari by the City of Paterson and a citizen of the City, the proceedings bringing up for review the validity of the resolution by the Passaic Valley District Sewerage Commission providing for an issue of one million dollars' worth of bonds for preliminary work con-
656 nected with the trunk sewer. The case was argued before three justices, two of whom sustained the constitutionality of the Act handing down their opinion July 23rd, 1904.

An appeal was taken from the decision of the Supreme Court as rendered, but on March 6th, 1905 the Court of Errors and Appeals by a vote of ten to one reversed the decision of the Supreme Court previously referred to, and declared the Act of 1903 unconstitutional, as it was an attempt to delegate an essential element of the power of taxation, because if taxing power could be deemed to be granted to the commission as a representative of the Sewer District, the latter is not a political district of the State and if the Passaic Valley Sewerage District were a political district of the State, it could not be invested with the power to tax persons and property beyond its own limits.

On May 11th, 1903, the Legislature of the State of New York enacted a law, being Chapter 539 of the Laws of 1903, which is the Act heretofore referred to. On June 2nd——

Q. By that, do you mean the Act creating this very commission?

A. Yes, creating the New York Bay Pollution Commission, and being Chapter 539 of the Laws of 1903.

Under that Act on June 2nd Governor Odell appointed as such commissioners, Dr. Daniel Lewis, State Commissioner of Health; Mr. Olin H. Landreth, Consulting Engineer of the New York State Department of Health, Dr. George A. Soper, New York State Department of Health representative at the Ithaca Typhoid Epidemic, and Mr. Louis L. Tribus, Commissioner of Public Works of the Borough of Richmond and Consulting, Civil and Hydraulic Engineer, also Doctor Myron S. Falk, Instructor in Engineering in Columbia University.

The New York Commission after organization, assigned certain

lines of work to each individual member for investigation.
657 The commission held eight meetings, including two joint meetings with the New Jersey Commission, and one public meeting on Staten Island, and prosecuted several lines of inquiry. It secured opinions on the legal questions bearing on the situation, from the New York State Attorney General, and in March 1904 submitted to the Governor a short progress report and asked for an extension of time in which to submit its final report, which was granted.

It also at its meeting of February 10th, 1905, formulated resolutions outlining the attitude which the commission should adopt towards the Passaic Valley Sewerage Commission. These results are as follows:

Mr. Riker (interrupting): I desire now to enter the objection to the testimony of this witness, since counsel's last question to him, that in so far as it purports to give the contents of public documents, statutory and otherwise, it is not the best evidence, and is not admissible, in *as* far as it attempts to give the witness' interpretation of the legal effect of statutes and decisions of court, this witness had not qualified as an expert, and it is not the best evidence, and insofar as it purports to give the substance of matters that were not testified to by the witness as having occurred in his presence it is hearsay testimony.

The Commissioner: Note the objection.

Mr. O'Sullivan: Complainants' Counsel urges the desirability of the retention of the testimony of this witness. He was a member of the commission appointed to investigate a threatened condition and every fact and circumstance relating to the threatened condition was confined in the outlined instructions. As the en-
658 terprise was brought into being as existed on paper and existed in state documents, legislative and otherwise, and in reports of a commission organized in the State of New Jersey for the purpose of materializing the enterprise, from which the State of New York apprehended a serious nuisance, and every document and paper which helped to influence this witness as a member of the New York Bay Pollution Commission and guiding his efforts towards outlining the seriousness of the apprehended danger are material in this inquiry as the enterprise today only exists today in the reports of the Passaic Valley Sewerage Commission, the powers given to them and the object of their existance all exist today merely in printed form, and are the only guidance as to the apprehended trouble outside of the investigations which have been conducted by the New York State Commission to see whether or not our harbor waters would satisfactorily cope with the magnitude of the threatened nuisance.

Mr. Riker: Counsel for the defendants urges and insists upon the objection already made on the ground that the excuses made by counsel for the complainants do not seem *the* obviate and do away with the ordinary rules of evidence.

Mr. O'Sullivan: Counsel for complainants desires to reply that

this witness' testimony does not go to the accuracy or to the legal procedure legislative or otherwise, in the enactment of these laws, but merely to the fact that such information as guided his activities, was gathered from the sources which he has described here.

Mr. Riker: Counsel for the defendants urges further that it now appears that this evidence is entirely immaterial to the issue.

The Commissioner: Note the objection.

659 Q. Did you depend, Professor Landreth, upon your own interpretation of these legal facts and circumstances or did you call upon the rightful State authorities whose functions it is to inperpret laws for public commissioners?

Mr. Riker: The question is objected to on the ground that it is immaterial and irrelevant.

The Commissioner: Note the objection.

The Witness: The commission formally called upon the New York State Attorney General for his opinion concerning a number of legal questions developed by the work of the Commission, and a written opinion of the Attorney General on these questions was rendered, and our conclusions as finally framed were prepared after receiving the written opinion of the Attorney General, as well as the opinion of a number of other specialists and persons and officials actively concerned with a number of the questions which were involved in the investigation of the commission.

The conclusions referred to are as follows:

The Commission unhesitantly protests against the confirmation of the present plan of construction——

By Mr. Riker:

Q. I ask this witness what he is reading from now?

A. I am reading from the printed copy of the conclusions contained in the report of the New York Bay Pollution Commission.

Q. At what page?

A. At page 31.

Mr. Riker: The reading of this part of the so called report is objected to on the ground that if it is material and relevant it has already been admitted in Exhibit No. 2, and on the further ground that the conclusions of ex-parte commissions cannot be probative matter in this case.

The Commissioner: Note the objection.

660 Mr. O'Sullivan: The complainants' counsel desires to state that these investigations disclose the careful research made by this commission in their preliminary efforts to ascertain whether or not we could tolerate with existing conditions the nuisance threatened, and reported such measures as would be desirable to obviate such threatened conditions and the conclusions and recommendations acting upon our legislature later, gave rise to another commission whose testimony will follow the testimony of this commission to show the earnestness and the impartiality with which we conducted the investigations and the efforts being continuously made

to induce the sister State of New Jersey to co-operate in our efforts in solving a serious problem of pollution.

You may proceed, Professor.

The Witness (continuing reading): * * *

"No. 1. As outlined by the Passaic Valley District Sewerage Commission.

"No. 2. It recommends that the Legislature authorize the Governor of the State of New York to appoint a Metropolitan Sewerage District Commission. This commission should continue similaw examinations to those conducted by the New York Bay Pollution Commission and should thoroughly investigate the question from engineering and economic standards and make preliminary surveys for an estimate of cost of a comprehensive system for oceam disposal of sewage of the whole *for* the greater portion of the districts in both New York and New Jersey, which are naturally tributary to New York Bay and adjacent waters.

Such an act of authorization should include a request that the State of New Jersey appoint a similar commission to work co-jointly with that representing New York, the two commissions to
661 co-operate in the investigations and recommendations as to a comprehensive scheme of ocean disposal for the districts and to outline two courses of procedure for later authorit-ive action by the two States respectively and the Congress of the United States.

This Commission ought to be provided with adequate funds for examinations, surveys, analyses, plans, etc., and the form of such a bill is presented herewith forming Appendix 8 of the Report of the New York Bay Pollution Commission following:

"In the event of the State of New Jersey pressing the construction of the proposed Passaic Valley Sewer planned, if such be authorized by constitutional ligislation, the commission recommended, first: that the Attorney General of the State of New York be authorized and directed to bring action in the Supreme Court of the United States against the State of New Jersey and the Passaic Valley District Sewerage Commission, upon his attention being called to any Act of said State of New Jersey or said Sewerage Commission towards carrying into effect the construction of said proposed sewerage system."

That forms the completion of the first portion of my report marked A.

Q. Now, what conference, if any, did your commission hold with other bodies or officials? From whom did your commission obtain information and expert opinion?

A. The Commission——

Mr. Riker (interrupting): The question is objected to on the ground that it is triple at least and may be quadruple.

Mr. O'Sullivan: I am dealing with an exceptionally intelligent witness, and for that reason I wish to anticipate unnecessary burdening the record by a number of questions that are unnecessary
662 in view of the extreme intelligence of this witness.

Mr. Riker: I press the objection on the ground that it is not

a single question, and that whatever it may in its quadruple aspect call for, is immaterial and irrelevant.

The Commissioner: Note the objection.

Q. Before answering the question, Professor, I would ask, did you understand my question?

A. I think so.

Q. Have you any doubt of it?

A. I understand your question to ask what boards or commissions the New York Bay Pollution Commission met with and considered, and from what officials and bodies we received expert opinions on the questions concerned.

Q. And which guided you in your conclusions and influenced your judgment?

A. Yes.

Q. Now you may answer that?

A. Our commission had interviews with a large number of citizens who possessed information and facts relating to the pollution of the waters of New York Harbor, the commerce on the same, the fisheries incident to these waters and ad-acent waters, also from persons who were conversant with the tidal condition and phenomena in the waters of New York Bay and a-jacent waters, also with representatives of the Passaic Valley Sewerage Commission to ascertain more explicitly and accurately the true intention of the New Jersey Commission with respect to the Passaic Valley project; also with officials of the State of New York and particularly with the State Attorney General.

Mr. Riker: I object to any testimony as to dealings with the officials of the complainants on the ground that it is an attempt to make statements or acts of complainants' own representatives testimony in this case.

The Commissioner: Note the objection.

663 The Witness: (Reading.) * * *

The State Attorney-General concerning a number of fundamental questions, legal in their nature, but which would have bearing on the matters under investigation by our commission. A number of those matters are represented by a series of questions submitted to the Attorney General, which questions with their answers by the Attorney General form Appendix No. 6 of the Report of the New York Bay Pollution Commission, dated March 31, 1905.

Those questions are as follows:

Mr. Riker (Interrupting): Now, I desire to enter the objection that the reading of this paper and which is part of the exhibit or the pamphlet marked Exhibit No. 2, on the ground that, first, if relevant it is already in exhibit No. 2; secondly, on the ground that it purports to be a statement made by a representative of the complainants; third, that if it is competent at all, it should be the testimony of the Attorney General himself.

Mr. O'Sullivan: Who is dead.

Mr. Riker: Yes. Or if any such information is relevant, it should

be presented by a witness, who shows himself to be an expert on the subject that he is dealing with.

Mr. O'Sullivan: Complainants' Counsel desires to press the reply included or expected from his question, on the ground that every fact and circumstance that operated upon this commissioner's mind, who is now on the stand, is entitled to be put on the record, so as to be subject to review and analysis and as he states that he aided in fashioning these inquiries that were submitted to our highest known interpreter of law for public commissioners, and was guided by the reply that he received we are entitled to know what the reply was, and what the questions were and what it sought information on, and what operated upon his very considerations either as conclusions or in fashioning portions of the report to which he is testifying.

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Mr. Riker: The objection is pressed on behalf of defendants, that unless the witness desires to excuse his own errors by reason of relying on the advise of the law officer of the complainants, this testimony is irrelevant.

Mr. O'Sullivan: This witness has not been accused of any error.

Mr. Riker: I did not say he is. I said if he wants to excuse——

Mr. O'Sullivan (interrupting): And he wishes to place at the disposal of the defendants in this litigation every fact and circumstance that operated at any stage upon his mind in fashioning his opinion or making the recommendations to the State Legislature and the State Governor, and we press the question.

The Commissioner: Note the objection of counsel.

Mr. O'Sullivan: Proceed.

The Witness: The following inquiries were submitted to the Attorney General John Cunneen:

First. What is the status of the waters of New York Harbor as to control over pollution by the Federal Government and by the two States of New York and New Jersey, Second: Whether the Federal Government would have jurisdiction over any phase of construction and operation of the large proposed trunk sewer to empty into the waters of New York Bay; Third: What power, if any, has the State of New York to impose conditions upon the State of New Jersey as to constructing the proposed sewer and operating it in the future; Fourth: Whether the New York Bay Pollution Commission is authorized by law to suggest detailed plans for changes in construction of the New Jersey Sewer if the same is to discharge into the waters of New York Bay and objection be made to the present plans as formulated by the New Jersey Commission; Fifth: Whether in the event this commission find it desirable to recommend for future consideration the establishment of a Metropolitan Sewerage District covering parts of the two States of New York and New Jersey, the Legislature of the two States would have authority to establish such a district and appoint a commission having adequate powers of administration?"

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Q. Were those questions submitted to the Attorney General as you have just stated?

Mr. Riker: Objected to on the ground that it is immaterial and irrelevant.

The Commissioner: Note the Objection.

The Witness: They were, and to these questions the Attorney General submitted his replies.

Q. What were his replies to your inquiries?

Mr. Riker: The question is objected to on the ground that the replies of the Attorney General of New York State are incompetent, irrelevant and immaterial.

The Commissioner: Note the objection.

The Witness: The reply of the Attorney General to the aforesaid questions is as follows:

Mr. Riker (interrupting): I would like to examine this witness on the paper that he is reading.

Mr. O'Sullivan: All right.

By Mr. Riker:

Q. What are you reading from?

A. I am reading from a copy of Exhibit No. 2 in this case.

Q. And what does it purport to be?

A. It purports to be Appendix No. 6 of that report.

Q. And what does it purport to be?

A. Appendix No. 6 purports to be a series of questions and answers submitted to and received from the New York State Attorney
666 General bearing on the questions which I have just read.

Q. Are they the original of those papers?

A. They are not; they are copies.

Q. Have you compared them?

A. I have.

Q. Have you compared this copy that you hold with the original opinion of the Attorney General, have you?

A. I did.

Q. When?

A. When received, or shortly after being received,—shortly after this report was received in my hands.

Q. Did you do the printing—the proof reading of this document?

A. I did not do the proof reading of this document I compared the printed document, however, with the original after it was printed.

Q. You compared this with the original of the Attorney General's opinion, did you?

A. Yes, sir.

Q. Where did you find the original of the Attorney General's opinion?

A. In the papers of the New York Bay Pollution Commission.

Q. Is it there yet?

A. I presume so; I have not had the custody of these papers.

Q. Have you looked for it?

A. I have not.

Q. Have you any reason to believe that it has disappeared?

A. I have not.

Mr. Riker: I object on the ground that it appears that the original document is procurable.

The Commissioner: Note the objection.

Mr. O'Sullivan: Counsel would like to say in answer to that that a thorough search was made, and the document we have not been able to find yet, that, among several others. They have been
667 stored and we have not been able to locate them, although we used diligence.

Mr. Riker: If counsel is going to offer secondary evidence, the proper way is to show by witnesses what search has been made and to account for the absence of the original, which appears by this witness to have been in existence, and to have been examined by him.

Mr. O'Sullivan: At this Stage, the issue is not on the authenticity of this legal opinion furnished by the Attorney General Cunneen, but is as to the facts and circumstances that operated on this witness's mind. This witness has testified that this copy which he holds in his hand has never left his possession from the time he received it from the printer, and that shortly after receiving it he compared it with the original opinion received from the Attorney General Cunneen. The fact that is material here is whether or not it operated upon his mind in the condition in which it appears as appendix 6 of Complainants' Exhibit No. 2. That is a material question at this point.

Mr. Riker: The objection is urged—is further urged upon counsel's statement that the purpose—that the condition of this witness' mind is not an issue in this cause, and is not material to the issue in this cause, except as bearing upon the credibility *of* the value of his testimony.

Mr. O'Sullivan: And the conclusions he arrived at and the material, documentary or other wise, that aided him in arriving at these conclusions and on the subsequent recommendations which he made to his own State Legislature, and which they acted upon.

Mr. Riker: The further objection is now urged that if the state of witness' mind is of importance to this inquiry, the truth
668 or falsity of the matters which influenced his mind is an essential feature in determining whether the state of his mind has any value in this inquiry.

Mr. O'Sullivan: The important feature is contended by complainants' counsel to be the facts and the conditions as set forth in Appendix 6 at this stage of the inquiry, and the fact that they operated in the presence with the number and in the condition in which they appear on pages 109, 110 and 111 and subsequent pages. Whether they are correct or incorrect, they operated in that condition upon this witness' mind in aiding him to arrive at the conclusion which he has testified to, and in so far are relevant.

The Witness: The reply of the Attorney General to the questions just read was as follows:

First in response to your inquiry No. 1., I beg to call your attention to the provisions of a treaty entered into between the States of New York and New Jersey in the year 1833 and subsequently

ratified by the Legislature of both States and approved by Congress. The first article of this treaty reads as follows:

Article I. Boundary line between the States of New York and New Jersey from a point in the middle of Hudson River opposite the point in the West Shore thereof, in the 41st degree of north latitude as heretofore ascertained and marked to the main sea, shall be the middle of the said river, of the Bay of New York, of the water between Staten Island and New Jersey and the Raritan Bay to the main sea, except as hereinafter otherwise particularly mentioned.

Among the exceptions is the following, contained in Article 3 of said Treaty:

"The State of New York shall have and enjoy exclusive jurisdiction of and over all the waters of the Bay of New York, and
669 of and over all the waters of the Hudson River lying west of Manhattan Island and to the south of the mouth of Spuyten Duyvil Creek, and of and over the lands covered by the said waters to low water mark on the westerly or New Jersey side thereof, subject to the following rights of property and the jurisdiction of the State of New Jersey."

The treaty then proceeds to "reserve to the State of New Jersey, the exclusive right of property in and to the land under the water lying west of the middle of the Bay of New York and west of the middle of that part of the Hudson River, which lies between Manhattan Island and New Jersey, and the exclusive jurisdiction of and over the waters, docks and improvements made — to be made on the shore of said State, and of and over vessels aground on said shore or fastened to any wharf or dock, except that the said vessel shall be subject to the quarantine or health laws, and laws in relation to passengers, of the State of New York, which now exist or which may hereafter be passed; the right of regulating fisheries is also reserved exclusively to the State of New Jersey, on the Westerly side of the middle of said waters."

"The case of the People of the State of New York against the Central Railroad Company of New Jersey, reported in 42 New York, at page 283, reviews at some length the question of the rights of the two States in the waters of the Hudson River, south of Spuyten Duyvil Creek, and west of the center of such river. This was an action brought by the Attorney General of the State of New York to abate as nuisances and cause the removal of certain wharves, piers and other erections extending into the harbor and river from the New Jersey shore, a distance of about a mile. The court, by Smith, Justice, in speaking of the provisions of Article 3, which are above quoted, giving the State of New York exclusive jurisdiction over the waters of New York Bay, and the Hudson River, lying west
670 of Manhattan Island and south of Spuyten Duyvil Creek, and of the lands under such water says: 'This provision in the treaty most clearly and distinctly gives and grants to and vests in the State of New York full, complete and undoubted, control government and jurisdiction of and over all the waters therein mentioned. Such was the clear intent and purpose of this provision and so far as it was essential to the proper exercise of such jurisdiction it give

control also of and over the land covered by such waters. It doubtless was designed in the clause of such provision in these words: 'Of and over the land covered by the said waters to low water mark; to disembarrass the jurisdiction so conferred upon the said water from all pretense of right to interfere therewith, arising from the legal maxim that the owner of the soil owned all above it cujus est solum, ajus est usful ad collum' so that the jurisdiction over the waters should be absolute and unquestioned for all practical purposes."

The Court then goes on to point out that the rights over the waters so granted to the State of New York were subject to the rights of the property under jurisdiction of the State of New Jersey and after reviewing the several clauses of the treaty bearing on the jurisdiction of the two States within the waters in question, the following rule was deduced as to the character of jurisdiction of the State of New York:

" 'It was to be a police jurisdiction of and over all vessels, ships, boats or crafts of every kind that did or might float upon the surface of said waters and over all elements and agencies and all instruments of commerce, while the same were afloat in or upon the waters of said Bay, and River, for quarantine and health purposes, and to secure the observance of all rules and regulations for the pro-
671 tection of passengers and property and for all governmental control designed to secure the interest of trade and commerce in said Harbor of New York, and preserve thereunder the public peace.

" 'By this exception it was designed that vessels afloat upon said Bay and River should not escape or evade the quarantine laws and the laws relating to passengers of New York by coming to harbor on or near the New Jersey shore, or by becoming attached to the wharves or docks on such shore or adjacent thereto, but in all other particulars, they were left subject to the laws of New Jersey.' "

And again the court says:

" 'These articles, I think, properly interpreted, concur in showing that it was the intention of this treaty that both States should maintain the absolute control of and over its soil and anything annexed or attached to it, and over every ship, vessel or other floating craft attached to any wharf or pier or located in any dock upon its shores, or aground in the waters adpoining its shore, and of and over all persons living or being upon such wharves or vessels all property therein, and that each State intended to throw the shield of its State law and its State property over all ships, vessels, persons and property.

" 'A crime committed upon any vessel fastened to any wharf on the shore or upon any vessel aground in the waters adjoining the shores of New Jersey and west of the center of said river or bay, except those offences specified in the said third Article, against the quarantine or the health laws in relation to passengers of New York, would be, I think clearly an offense against the peace and dignity of New Jersey and cognizable exclusively in her courts.' "

672 "It was accordingly held in this case that the courts of New York have no jurisdiction to restrain the erection or order the removal of the structure complained of.

"It has however, been since held in the case of Ferguson against Ross, No. 126 New York, page 459, that an action to recover a penalty for an alleged violation of the provisions of Chapter 414 of the Laws of 1885, amending Chapter 604 of the Laws of 1875 prohibiting the deposit of any material dredged or excavated from a slip, basin or other place in the North or East Rivers, or in the Bay of New York, within the jurisdiction of the State of New York, might be recovered in an action in the courts of this state, where such dredgings were deposited in the waters west of the center of the Hudson River, and south of Spuyten Duyvil Creek, and the right of the State of New York to pass a law imposing such penalty was upheld.

"From a perusal of these two cases it will be seen that the jurisdiction of the State of New York in and to all the waters of the Hudson River and New York Bay is primarily a police jurisdiction for sanitary and quarantine purposes, and the right of the State of New Jersey to erect wharves, piers, bulkheads and improvements from its shores into said waters is specifically upheld in the Central Railroad case, from which I have above quoted.

"Over and above the rights of the two contiguous states is the right of the Federal Government in the navigable waters of the New York Bay and Hudson River so far as the protection of navigation is concerned.

Reference: See State of Pennsylvania v. Welling Bridge Company and others, 13 Howard page 518.

"Answer no. 2——

673 Q. That was the answer, was it, to the second query that you put to the Attorney General?

A. Yes, sir.

"In response to the second inquiry as to whether the Federal Government would have jurisdiction over any phase of the construction and operation of a large proposed trunk sewer to empty into the waters of New York Harbor, I beg to call your attention to the facts relative to such sewer in the particular case under consideration. In 1902 the Legislature of New Jersey established what was known as the Passaic Valley Sewerage District, which embraced a large number of municipalities and parts of municipalities, in the counties of Passaic, Bergen, Hudson and Essex, and at a special session of the Legislature in 1903, an Act was passed to relieve from pollution the rivers and streams within Passaic Valley Sewerage District and providing for the raising, collections and expenditures of the necessary moneys. The plans of the commission appointed under this act provide for the emptying of the sewage from the district in question which is estimated to contain nearly one million five hundred thousand inhabitants, into the waters of New York Bay, near Bedloes Island on the New Jersey side of said line as defined in Article 3 of the treaty hereinbefore quoted from.

No facts have been submitted as to whether or nor the construction of the proposed sewer and its operation, would, as a matter of fact, interfere with the navigation of the Hudson River and New York Bay. If there is any such interference, I am of the opinion that the Federal Government could and would interpose and assert its rights and free such rivers from such obstruction or interference with navigation.

As to the jurisdiction of the Federal Government in the matter, it would seem to me that under the authority of the State of
674 Missouri against the State of Illinois, the sanitary district of Chicago, the Supreme Court of the United States would have original jurisdiction in any proceeding which might be instituted by the State of New York to restrain the construction or operation of the proposed sewer.

The case above mentioned arose in regard to the construction and operation of the so called Chicago Drainage Canal, whereby sewage from the City of Chicago was, through intermediate channels of the drainage canal and the Illinois River emptied into the Mississippi River, which, at that point ran between the States of Illinois and Missouri. The State of Missouri sought in the Supreme Court of the United States to restrain the emptying of such sewage into the Mississippi River.

The bill in the action was demurred to, but the court sustained the right of the State of Missouri to maintain this proceeding. The Court said:

"'An inspection of the bill discloses that the nature of the injury complained of is such that an adequate remedy can only be found in this court at the suit of the State of Missouri.

"'It is true that no question of boundary is involved nor the direct property rights belonging to the complainant State, but it must be thoroughly conceded that if the health and comfort of the inhabitants of the state are threatened, the State is the proper party to represent and defend it.

If Missouri were an independent and sovereign State, all must admit that it could seek a remedy by negotiating, and that failing, by force. Diplomatic powers and the right to make war having been surrendered to the general government, it was to be expected that upon the latter would be devolved the duty of providing a remedy, and that remedy we think is found in the constitu-
675 tional provisions we are considering.'"

"'The allegations of the bill plainly form such a case. The health and comfort of the large communities inhabiting those parts of the State situated on the Mississippi River are not alone concerned, but contagious and typhoidal diseases introduced into the communities may spread themselves through territory of the State. Moreover substantial impairment of the prosperity of the towns and cities of the States situated on the Mississippi River including its commercial metropolis would seriously affect the entire State.'"

"The reason above would apply with equal force to the case under consideration. The sewage from territory inhabited by a million

and a half of people cast into the waters of New York Bay in addition to the sewage already emptied into those waters, might easily create a condition which would injure the health of the great City of New York, which is the important metropolis, not only of the State but of the Country.

Mr. O'Sullivan: Mr. Commissioner, do you think it is a convenient place to adjourn for recess?

The Commissioner: Yes, we will take recess until 2 P. M.

Adjourned until 2 P. M.

676 CITY HALL, NEW YORK,
September 20th, 1911—2 p. m.

Professor OLIN H. LANDRETH, a witness on behalf of the complainants, recalled, for continued direct examination, testified as follows:

Direct examination (resumed).

By Mr. O'Sullivan:

Q. Professor, you left off at that part of the legal opinion of the Attorney General Cunneen, in which you drew attention to the possibilities of injuring the health of the great City of New York. Proceed.

A. Continuing in the opinion of the Attorney General he said: "It is therefore quite clear to my mind that should such a condition arise, the State of New York would be authorized to begin proceedings in the Supreme Court of the United States to compel the State of New Jersey, and the Passaic Valley Sewerage District, to refrain from polluting the waters of New York Harbor, with this great mass of sewage.

"Third. In response to your third inquiry I beg to inform you that while the State of New York can of course enter into any negotiations it sees fit with the state of New Jersey that it cannot impose and inforce any conditions in reference to the construction and operation of such sewer upon the Passaic Valley Sewerage District, or the State of New Jersey, which would be enforceable in any other way than by proceeding in the United States Supreme Court
677 to restrain the use and operation of such sewer. In other words, while under the authority of Ferguson vs. Roth above cited, the State of New York may pass a law prescribing the penalty for dumping sewage into the waters of New York Harbor, or the Hudson River as far west as the low water mark on the New Jersey Shore, I am of the opinion that such penalty cannot be enforced or collected as against the State of New Jersey or the Passaic Valley Sewerage District in the courts of this State, and that, therefore, the proper forum from which to seek redress would be the United States Supreme Court.

"No. 4. In response to your fourth inquiry, I beg to call your attention to the statute creating the investigating committee of the State. Section 2 thereof provides as follows:

'Such commission shall confer with the authorities of the State

of New Jersey, take the testimony of witnesses, if necessary, and otherwise make such investigations as it may deem advisable, to determine the character of such threatened pollution, if any, and the means necessary to effectually prevent the same in order to protect the health of the people of this State.'

"In view of the fact that the State of New Jersey would in no way be bound to act upon specific recommendations or suggestions or detailed plans for changes of the construction of the sewer. I see no reason why your commission should not submit such suggestions and recommendations if it saw fit, the same as it might submit the same at any oral conference had under the provisions of the section above quoted, with the authorities of the State of New Jersey.

"No. 5. As to the fifth and last inquiry I am of the opinion that the States of New York and New Jersey, may, if they see fit,
678 construct Metropolitan Sewerage Districts covering parts of the territory of the two States and giving jurisdiction thereover to the courts of one of the two states, as to all matters pertaining to the proper sewerage of said district. Such concurrent acts of the States of New York and New Jersey, should, however, in my judgment, be approved and retified by an Act of Congress, for the reason hereinbefore set forth, namely: That the Federal Government has Supreme Court control over the navigable waters of the Hudson River and New York Bay, and its approval therefore should be had to the joint action of the contiguous states. As to the power of the Attorney General to proceed against the State of New Jersey and the Passaic Valley Sewerage District to restrain the construction or operation of the proposed sewer, I am of the opinion that Section 52 of the Executive Law which gives to the Attorney General power to prosecute and defend all actions and proceedings in which the State is interested is broad enough in its terms to include the authority to begin such restraining action.

"In support of this theory, it will be noted the right of the Attorney General to begin a similar action does not seem to have been questioned in the case of The People against the Central Railroad of New Jersey hereinbefore quoted from. And the case of Missouri against Illinois specifically holds that the pollution of a navigable stream is a matter in which the State is interested and therefore a proper question for its legal representatives to act in behalf of the State." That was the close of his opinion.

Q. There was a second line of investigations allotted to you by the Commission, and to which you testified relative to ocean disposal of sewage. What did you do in direction conformity with the allotment of that subdivision of work?

679 Mr. Riker: The question is objected to on the ground that it does not appear that the State of New Jersey defendants in this suit, have any intention or are charged with an intention of disposing of sewage by ocean disposal, and that therefore this inquiry is entirely irrelevant and immaterial and no issue in this cause.

The Commissioner: Note the objection of defendants' counsel. Answer the question.

The Witness: Under subdivision B. of the topic assigned to me concerning the second division, namely, Ocean Disposal as a possible solution of the sewerage problem for the entire Metropolitan District, regardless of state boundaries, the following facts and conclusions were reached:

Mr. Riker: You are proceeding to read from your copy of Exhibit No. 2?

The Witness: I have not so far.

Mr. Riker: I say you are proceeding to?

The Witness: I am going to read, yes, sir.

Mr. Riker: Well I shall object for the same reasons given as to the reading of the part which is section A of your part of the report or of the exhibit.

The Commissioner: Note the objection.

The Witness: As the result of such study, we found that the waters of the Metropolitan District of New York and adjacent territory constituted an invaluable inheritage to the inhabitants. In their relation, these waters comprise a chief source of the strength of New York as a commercial metropolis, in their intersection and subdivision of the territory. While in outward appearances they are adverse to intercourse and transportation, in reality they are found uniting the several districts through an incomparable
680 network of waterways, through which the distribution of traffic and local transportation is carried on more conveniently, effectively and economically than if the waterways did not exist. In their climatice and sanitary relations they mitigate the heat of summer and offer breathing places and water parks which no city could ever afford artificially to provide. A large proportion of the metropolitan population of New York and adjacent territory passes twice daily over one or another of said water ways of the district. Another considerable portion lives on or near the shores and still other large parts frequent the water for bathing, for pleasure and as an avenue to numerous nearby water resorts.

It is hardly necessary to say that these waters so important to the interests of the entire metropolitan district lying both in New York State and in New Jersey should be protected against impairment and injury, and the existing conditions which injuriously affect it should as rapidly as possible be corrected.

The most serious menace to these waters lies in their pollution by the waste of the great suburban district. This pollution has already reached a stage which warrants the closest consideration and the utmost concern. Even the present conditions, unsatisfactory as they are, would have been worse but for the continued past efforts and action looking to the protection of these waters. These restraining efforts have, however, been confined entirely to the matter of the disposal of the street sweepings combustible and noncombustible refuse and garbage and while much yet remains to be accomplished along these commendable lines of activity, decided beneficial result has already been obtained, in that a policy of treatment has been adopted, the work organized, the machinery set in motion and the

matter therefore in condition, not only to yield beneficial
681 results but also readily open to improvement and expansion.

These remidial activities have touched only one general class of pollution, namely, the City waste and garbage which represent when discharged into the waterways, the chief source of sedimentary deposits and the visible suspended matter. No steps whatever have been taken, however, towards provision for the proper ultimate disposal of the sewage of this extensive district, if we except a few small municipalities whose aggregate population forms an insignificant part of the entire metropolitan population. Up to this time the only thought has been how to conduct the sewage by the cheapest route to this waterway, giving no thought whatever to its effect on the water ways and on adjacent water ways. While the crude discharge of even moderate amounts of sewage into the waterways is injurious to the waters, the harmful results increase at a more rapid rate than the increase in sewage discharge and the limit is soon reached beyond which discharge produces such obnoxious conditions of the waters as would be condemned by even low standards of quality. The evidence now available tend- to show that this limit is now not far distant and that considerable increase in the present volume of sewage discharge into the waters of the district will be quite certain to produce decided aggravated conditions of those waters, which even present standards of excellence will condemn.

Our present standards are, however, too low, and the simple advancement in public intelligence and taste which demand better public utilities, better sanitation and conditions for living and more exacting requirements in presentable and artistic surroundings, will soon insist on the present conditions of our Metropolitan waters as repulsive and intolerable.

682 These two general facts, namely: that the waters of New York and vicinity are already badly polluted, and that this pollution must, of necessity rapidly become worse and soon reach an intolerable limit, leads us to the problem of the remedy. Two general lines of relief present themselves for consideration:

First. Improved sewage disposal for each local district or municipality within or near its own bounds;

Second. A comprehensive scheme for ocean disposal of the crude sewage of the entire metropolitan district, lying both in New York and New Jersey.

On a question of such importance and magnitude, even general conclusions should be definitely adopted only after the most able and exhaustive study and investigation, neither of which have the circumstances and conditions attending the appointment and work of this commission rendered possible. Such consideration, however, as it is possible to give this question seems to point to the second plan, or that of crude discharge out to sea, as the most promising solution of the problem and the one which on further investigation will probably be found most feasible and efficient.

The following conclusions should be, therefore, all that may properly be expressed:

First. The condition of the waters in and adjacent to the Metropolitan District lying both in New York and New Jersey is rapidly approaching the limit in pollution, which not only should not be passed, but what already calls for a radical relief;

Second. The two most apparent forms of such relief are:

a. The installation and operation of individual systems of sewerage disposal for each district or municipality, and the
683 discharge of the purified effluent into the water ways; or

b. The gathering of the crude sewage of the entire Metropolitan District to several centers and the conducting or pumping of the same by one or more outlets or tunnels, out to sea, at sufficient distance to insure against its return at flood tide to the extent that will injure the waters of the district.

This plan would probably make desirable the creating of an Interstate Metropolitan Sewerage District, created by treaty between the two states of New York and New Jersey, and ratified by Congress and having full administrative powers with full provision for all questions of legislative, executive and judicial jurisdiction.

Third. The conditions of appointment of this commission have not made it proper or possible to give this matter of relief that exhaustive study and investigation which the importance of the question demands, and therefore no final conclusions or recommendations can be made as between the above two plans of relief, or possibly others. Beyond the statement that the latter plan of ocean discharge of crude sewage of the entire district appeared, from the consideration given it, to possess the greater advantages.

This commission is clearly of the opinion that an investigation of the best plan of relief for the waters of New York and vacinity is an urgent necessity and should be undertaken at once and that pending completion of such investigation and inspection of the plan of relief, no extended or considerable changes of extensions should be made in the sewerage of such portions of the Metropolitan district as would be disturbed or sacrificed by the ultimate adoption and installation of a comprehensive scheme of improvement."

684 Q. When was that report submitted to the New York State Legislature and its Governor?

A. That was submitted to the Governor on March 31st, 1905, it was submitted in the Senate on May 1st, 1905.

Q. In line with the recommendations based upon the conclusions of the New York Bay Pollution Commission, did they suggest any Legislation with a view to furthering the conclusions and a more extensive investigation, and seeking co-operation with the State of New Jersey?

Mr. Riker: The question is objected to on the ground that it is immaterial and irrelevant and does not make any difference what the commissioners suggested to the New York Legislature so far as the issue in this cause is concerned.

The Commissioner: Note the objection of counsel.

The Witness: They did.

Q. What form did that recommendation take?

Mr. Riker: The same objection.
The Commissioner: Note the objection.

The Witness: That form took the shape of a recommendation framed by the commission and submitted as an appendix of its report, consisting of a draft of a proposed legislative act providing for the creation and work of such commission as would make the investigation more thorough and extended and would enable definite conclusions to be reached. That draft forms Appendix No. 7 of Exhibit No. 2 in this case.

Q. No. 7 or No. 8?

A. I should say No. 8. And it is found on page 121 of that report. The draft was as follows:——

Mr. Riker: I object to the reading of it, and I now appeal to counsel for the complainants to state on what grounds he thinks it is a relevant piece of evidence or evivential in any way
685 in this case, with a view of endeavoring to keep this record within reasonable limits.

Mr. O'Sullivan: Counsel for complainants replies that this recommendation was acted upon and a later commission with enlarged powers created which undertook extensive scientific investigations, with a large appropriation and with a view to securing the co-operation of the New Jersey authorities in solving this problem of harbor pollution and in the chain of sequence of the laudable efforts that have been made by this State to fully acquire knowledge through competent men of the actual conditions, their menacing dangers and their remedies, it is an important link in the chain of the investigations and in the good faith in which the State of New York approached these investigations, acting upon the recommendations of men especially fitted to make the inquiries.

The Commissioner: Note the objection of counsel for the defendants.

Mr. Riker: The objection is renewed on the ground that counsel is unable to see any legal basis for the admission of this testimony, under the statement made by counsel.

Mr. O'Sullivan: It is part of a state document, Senate document, No. 39 of this State.

The Witness: The draft of the bill recommended was as follows:

"An Act to provide for the appointment of a Metropolitan Sewage Commission and making an appropriation therefor.

"The people of the State of New York represented in Senate and Assembly do enact as follows:

Sec. 1. The Governor is hereby authorized to appoint within thirty days after the passage of this Act five citizens of the
686 State, two at least of whom shall be residents of the City of New York, who, together with the State Engineer and Surveyor, the State Attorney General and the Mayor of the City of New York, shall constitute a temporary commission to be known

as the New York Metropolitan Sewerage Commission. One at least of the five citizens members should be a lawyer and two at least should be civil engineers.

Sec. 2. The duties of this commission shall be to continue the work of the New York Bay Pollution Commission established by Chapter 539 of the Laws of 1903, and to extend the work of this commission so as to include the following duties:

First. To make further investigations into the present profitable future condition of the purity and pollution of the waters of New York Bay, and of the rivers and the other bodies of waters tributary thereto and adjacent to the several Boroughs of New York City and its neighboring districts.

Second. To consider and investigate the present conditions and the future need for sewerage and sewage disposal in New York and in the adjoining municipalities and neighboring districts.

Third. To co-operate with any duly authorized body or commission having similar authority from the State of New Jersey in the general consideration of the most effective, efficient and feasible means of permanently meeting and protecting the purity of the waters of New York Bay and the rivers and other bodies of water tributary and adjacent thereto, making in addition to their inquiries, examinations, investigations and surveys to determine the best plan for the final disposal of the sewage of the entire Metropolitan District lying in both states, either by discharging or
687 pumping the same through large outlet sewers or tunnels out to sea, or by other means; and also giving particular consideration to the best system of administrative control for the inspection, execution and operation of such plant for ultimate sewage disposal by a separate and distinct sewerage district, and a permanent commission in each State or by one interstate Metropolitan Sewerage District and Commission, to be established by an agreement between the two states, if necessary, to be ratified by Congress or by other courts.

Fourth. To submit to the Legislature in writing on or before February 1st, 1908, a full and complete report of its investigations, surveys and estimates of cost of the several plans deemed worthy of special consideration; also to submit such definite conclusions and recommendations as may have been reached co-jointly by the Metropolitan Sewerage Commission herein established, acting in conjunction with any similar body appointed by the State of New Jersey relating to the most effective efficient and feasible means or plan of permanently improving and protecting the purity of the waters of New York Bay and of the rivers and other bodies of water, tributary and adjacent thereto, as well as a definite scheme for the administration of the inspection, execution, permanent operation and government of such means or plan of improvement and protection.

Sec. 3. The members of the New York Metropolitan Sewerage Commission herein provided for shall, before entering upon the discharge of their duties, take and subscribe the constitutional oath of office and file the same with the Secretary of State. They

shall within twenty days after appointment, and at the call of the State Engineer, meet at the office of the latter in Albany, and
688 shall organize by the selection of one of the members to be Chairman of the commission and another to be Secretary. The commission may engage such engineering, legal and other expert service and advice, and such clerical, stenographic and other assistants as it may deem necessary for the prosection of its duties.

Sec. 4. Each member of the commission shall have the power to administer oaths, and the commission shall have the power to subpœna witnesses and take testimony, and in addition shall have all the powers of legislative committees provided by Article 3 of the Legislative Law. The members of the commission and all persons duly authorized by the commission shall have the right of entry and passage to any place or property for the purpose of making surveys or examinations.

Sec. 5. The commission shall terminate on February 1st, 1908, and all maps, results, or surveys and examinations estimates and other papers and matter acquired by the commission shall be properly indexed and labled and turned over to the State Engineer and Surveyor.

Sec. 6. The members of the commission shall receive no salary, but shall be paid their reasonable and necessary expenses actually incurred in the prosecution of their duties, and the five citizen members shall be each paid a just and reasonable per diem compensation, to be determined by the Governor, for the time actually and necessarily employed on the work of the commission.

Sec. 7. The sum of fifteen thousand dollars, or so much thereof as may be necessary is hereby appropriated out of the moneys in the Treasury not otherwise appropriated, for the purposes of this Act, to be paid by the State Treasurer, on the warrant of the
689 Comptroller on the order of the Chairman of the Commission.

Sec. 8. The Secretary of State is hereby authorized and requested to communicate with the Governor of the State of New Jersey, transmitting a copy of this Act, and to extend through him an invitation to the State of New Jersey to co-operate with the State of New York in the carrying out of the purposes to be obtained by this Act and to appoint a commission to represent the State of New Jersey and unite with the New York Commission authorized by this Act in the investigations, surveys, conclusions and recommendations herein provided; it being desired, that, if possible, the two commissions may reach similar conclusions and agree on a common plan for the accomplishment of the purpose to be obtained from this Act, and that they may submit identical or similar reports and recommendations to their respective legislatures.

Sec. 9. This Act shall take effect immediately."

By Mr. O'Sullivan:

Q. Professor Landreth, did the Legislature, subsequently act upon these recommendations, that is the New York State Legislature?

Mr. Riker: Objected to on the ground that it is immaterial and whatever action might be taken is the action of the complainants and inadmissible in this cause.

The Commissioner: Note the objection.

The Witness: It did, and subsequently passes an Act containing all of the essential provisions of this Act, but differing from it in a few particulars.

690 Mr. Riker: I move that answer be stricked out as not responsive to the question and as containing an opinion of law by this witness as to the effect of the statute.

The Commissioner: Note the objection.

Q. And under the enactment on these recommendations, creating the Metropolitan Sewerage Commission, were you appointed a member of that Metropolitan Sewerage Commission?

A. I was.

Q. Have you stated, Professor, your full activities or the results of those activities as a member of the New York Bay Pollution Commission?

A. I think I have in general. There are very many details both as to procedure and results which I may not — naturally, covered; but I think in the main I have mentioned all of the general results.

Mr. O'Sullivan: Your Witness, Mr. Riker.

Cross-examination by Mr. Riker:

Q. Where do you live, Professor?

A. I live at Schenectady, New York.

Q. And have you lived there all the time while you were connected with the New York Bay Pollution Commission?

A. Yes, sir.

Q. You graduated from Union College

A. Yes, sir.

Q. In 1876?

A. Yes, in one course in 1876.

Q. In what course was that?

A. The course leading to the degree of Civil Engineer.

Q. What other course did you take?

A. I took—I remained a year after graduating as a Civil Engineer, in order to complete what I had previously commenced, a course leading to the degree of Bachelor of Arts, and which I had not completed at the time of graduating as Civil Engineer, and I graduated in the latter course in the year 1877.

Q. Since your graduation in the year 1877, what have you done, professionally?

690½ A. For the first two years after graduation I was assistant astronomer at Dudley Observatory, an Astronomical Observatory at Dudley New York.

Q. Did your activities as Assistant Astronomer particularly qualify you for any commission that you had to perform under this Commission?

A. Why, in general ways it did; in specific details, it did not.

Q. Well, now, will you go on since your ceasing to be an Assistant Astronomer?

A. At the end of two years I resigned from Dudley Observatory and accepted the professorship of Civil Engineer at Vanderbilt University, Nashville, Tennessee.

Q. How long did you remain there?

A. I remained there in that capacity for fifteen years.

Q. And then?

A. During the latter seven or eight years, or six or seven of which I was also Dean of the entire Engineering Department.

Q. And after that?

A. After that, in the summer of 1894, I resigned from Vanderbilt University to accept the Chair of Civil Engineering, or rather to occupy the Chair of Civil Engineering, which I had accepted the December preceding, at Union College, Schenectady. I was invited but declined to enter on the duties of that new chair during the year, but consented to do so at the end of the existing year at Vanderbilt.

Q. Did you accept it and did you enter upon the duties, and have continued there ever since then?

A. Yes, sir.

Q. Have you specialized in any way in engineering?

A. Yes, sir.

Q. In what line?

A. In the line of sanitary and hydraulic engineering, during the last ten or fifteen years; prior to that my work was of a more general nature.

691 Q. And you held lectureship in Union College?

A. I called it a professorship.

Q. Did you lecture as professor?

A. I gave instructions, and that instruction included among other lines of activity, lectures.

Q. Along what lines?

A. Lines of structural engineering, hydraulic engineering and sanitary engineering, and motive power.

Q. And motive power. Now the branch of sanitary engineering is the one that is particularly involved in this New York Bay Pollution Commission matter, is it not?

A. That is one of the important matters involved.

Q. I asked you whether or not the one chiefly involved so far as your scientific training is concerned?

A. Yes, it is the one in my specialities. It is the most important one in the list of my specialties.

Q. Now, what particular work have you done in this particular branch of your profession?

A. Well, I shall have to go back a time even prior to my entering college, because, I did a number of years of professional work even before going to college. My first work in sanitary engineering was in connection with surveys, plans for a system of water supply for what is now the City of Olean, then the village of Olean, New York.

Q. Water supply?
A. Yes.
Q. You class that as sanitary engineering?
A. Certainly.
Q. All right?
A. My next was in conjunction with the study of plants for the alteration and reconstruction of the water supply system of the City of Schenectady.

Q. That you class as sanitary?

692 A. Yes. My next work in sanitary engineering—I shall have to refer to data as to the chronological order, if you don't object.

Q. Well perhaps it is not of much importance, but just as you please?

A. My next work in sanitary engineering, the survey for the plants for a sewer system for Vanderbilt University at Nashville, Tennessee. My next work covered surveys for and plans for a system of water supply for the City of Fort Valley, Georgia. Also similar studies and surveys and plans for water supply of West Nashville, a suburb of the City of Nashville, Tennessee. The next covers surveys for and plans for and advice during construction of a system of water supply in conjunction with electric light system for the City of Crowley, Louisiana My next engagement related to an engagement as Consulting Engineer on water supply for the Town or Morganfield, Kentucky; then a similar engagement as consulting Engineer on the Construction of a new system of water supply for Union City, Tennessee; then engagement as Consulting Engineer to the Board of Public Works of Nashville, Tennessee, to study the possibilities of the existing water system, and plan for their rehabilitation pending designs for a construction of an entirely new system. Also continuing the same egnagement with the Board of Public Works, I was Consulting Engineer on the preparation of general plans for investigations of and construction of an entirely new system of water supply for the City.

I have also been engaged in the Consulting Engineering capacity in connection with the water supply at Gloversville, New York, Watervliet, New York; Whitehall, New York; I have also made plans for the sewerage and sewage disposal for the Village of Saranac Lake, New York; Cuba, New York, revised and recommended changes of plan for the system of sewerage and sew-

693 age disposal for the City Durango, Colorado; also revised originally prepared plans for sewerage and sewage disposal for the Village of Norwood, New York, made plans and superintended construction for sewage disposal for Saranac Inn, New York; White Sulphur Springs, New York; made plans for a system of sewerage interception and disposal for the City of Johnstown, New York, was Consulting Engineer on the preparation of plans for sewerage and sewage disposal for the village of Skaneateles, New York; Dolgeville, New York. I was consulting engineer in the consideration of several rival plans for the sewerage and sewage disposal for the Village of Batavia, New York; I was consulting

Engineer to the State Board of Health of Tennessee, and as such, made investigations as to the sanitary effect of their proposed locking and damming of the Cumberland River. I was also sent by the State Board of Health of Tennessee to the World's Exposition in Chicago in 1893 to examine and report on the sanitary features exhibited at the World's Fair. And I was for ten years Consulting Engineer of the New York State Board of Health and subsequently to the State Department of Health, making in that time over one hundred separate investigations bearing on water supply, sewerage disposal, stream flow, stream pollution, floods, danger from various sources, &c.; also passed on many sets of plans for municipal water supply, sewerage and sewage disposal for cities and towns which by law were required to meet the approval of the State Department of Health before being constructed, among them plans for the cities of Elmira, Utica, Watertown, Corning, Cornell, Hudson, Schenectady, Auburn, Syracuse, Troy, Saratoga, Middletown, Bingham, Kingston, Yonkers, Tarrytown, Rome, Plattsburg and Port Jervis.

694 Many of these were not complete plans for the entire sewerage of the City but important alterations and extensions of the same as the water supply for these towns. Was made a member of the State Water Storage Commission, appointed to investigate Floods and water storage with respect to danger to life and property and with respect to the methods to be followed in the avoidance and prevention of floods. This was the predecessor of the State Water Storage Commission so far as relates to Water Storage and Storm Protection and Improvement.

Q. That is hydraulic engineering, Isn't it?

A. Hydraulic and sanitary, both. There are a number of others that involved in a minor degree the element of sanitary engineering, but those are the major ones.

Q. What was the largest town, city or village for which you made personal, independent plans and surveys and specifications for sanitary engineering work?

A. I meant to state in that connection that I prepared a complete plan for water supply the surface drainage, sewerage and sewage dispocal for an extension to the City of Erie Pennsylvania, which is now being built by the General Electric Company for its plant there. Answering your question more specifically, I should say——

Q. (Interrupting.) That is not answering my question at all. I object to his using the words "more specifically."

A. Strike out the words "more specifically." Answering your question, I should say that the largest city for which I prepared extensive and general plans was the City of Nashville, Tennessee.

Q. Well, did that cover the whole city of Nashville, Tennessee?

A. Yes.

Q. Was it accepted?

A. Yes.

Q. And built.

A. Yes.

695 Q. What did you do, did you prepare it yourself?

A. I first had charge of all the investigations and studies, and submitted as a result of them a general report, which was accepted with a few minor exceptions which were not accepted. Then during the execution of that work, I was retained as Consulting Engineer to the City, the immediate charge of the work however being in the hands of the City Engineer.

Q. How large was the City of Nashville at that time?

A. A population of 100,000.

Q. When was that?

A. That engagement covered about three years from, I should say, from 1885 to 1888, as near as I recall it.

Q. During your association with the New York Bay Pollution Commission, did you do any independent work as an Engineer—sanitary engineer?

A. I do not quite understand just what is in mind when you say independent work.

Q. You don't understand the question. Did you make any original observations upon the conditions prevailing in New York Harbor or New York Bay while you were a member of this Commission?

A. I did not make any chemical or bacteriological examinations.

Q. Did you make original observations and investigations of any of the phenomena or features of the New York Bay, which came under the consideration by the New York Bay Pollution Commission?

A. I did not myself, except as to physical conditions, which I in many cases observed and except in the case of a study of data obtained by other assistants and associates which I carefully studied before I made any direct observations of a scientific nature myself.

Q. You assumed the correctness of the data which was furnished to you?

A. After adequate verification, yes, sir.

696 Q. Well, now, what verification did you make of the data furnished to you by other observers?

A. Well, the usual methods of verification, of accuracy and reliability of a subordinate's work; first as to the general methods followed; second, as to the faithfulness with which the details were carried out; third more or less frequent checks on the reliability of results, and always—and generally for checks by comparing the data with other data corresponding thereto.

Q. Well, now, directing you- attention to the personal checks that you made upon the data, what were they?

A. Why, as I said before the usual procedure which an engineer follows in assuring himself that the work of his subordinate is correctly done.

Q. Part of the data which came under your observation was the bacteriological and chemical analyses of samples of water, were they not?

A. Yes.

Q. Did you check them up by making examinations yourself?

A. Not my own, no.
Q. Then you did not check them up at all, did you?
A. Not by my own observations.
Q. Did you check them up at all?
A. Not in that way.
Q. Did you check them up at all?
A. Yes.
Q. How?
—. By comparing with studies of similar results reached in substantially similar conditions.
Q. By yourself?
A. By myself.
Q. What conditions can you now state as being similar to those which were presented by the bacteriological tests upon the first series of samples of water which has been stated to have — taken from the New York Bay?
A. By comparative studies of the results furnished by the same man in different——
Q. (Interrupting.) By what?
A. By the same man in different places, and under different
607 conditions, second; by references drawn from supposedly similar conditions by different men. I made no check observations myself only in that way.
Q. Did you as member of the New York Bay Pollution — devote you- whole attention to the supposed threatening invasion of the State of New Jersey?
—. No, certainly not.
Q. Well, you have stated here that that was a commission that was given you by the Act of the Legislature, have you not?
A. Yes.
Q. In carrying it out did you feel it necessary then to examine into other features of the situation?
A. Will you please read the question before the last question.

The question referred to was read by the stenographer, as follows:
"Q. Did you as a member of the New York Bay Pollution — devote your whole attention to the supposed threatening invasion of the State of New Jersey?"

A. My answer to that was framed on the supposition that the expression in the question "Full attention" related to my whole time, and if you mean that, that is my answer, my answer is correct as it stands. If you meant to ask whether or not we gave exclusive consideration to the New Jersey question, then I will say no, we took other collateral conditions and facts into consideration.
Q. Now what other collateral facts did you personally take into consideration?
A. Perhaps next to the New Jersey problem, the question of the existing problem on this side of the State Boundary.
Q. With respect to what feature of that commission, did you think that investigation was useful?

A. With respect to an intelligent understanding of the
698 present condition of the New York Harbor Waters.

Q. What did you find to be the present condition of the New York Harbor waters from your personal investigations of them?

Mr. O'Sullivan: One moment; that is somewhat ambiguous. This gentleman has testified to conditions that——

Mr. Riker: Sorry I cannot be as clear as you, but I must insist upon his answer.

Mr. O'Sullivan: I object to the question.

The Commissioner: Note the objection.

Mr. O'Sullivan: You are dealing with the time of 1905 when he testified; now you are dealing with it as if it was a time as of 1911.

Mr. Riker: Read the question.

The question was read by the stenographer.

A. Well, assuming that you refer to the condition at the time of the investigation, I may say in general that the conclusion reached by me — well as, I think, that by the other members of the commission was that the waters of New York Harbor were already polluted to a considerable extent by the unavoidable and non preventable pollution that comes down from the water sheds; secondly that they were also polluted by the existing sewage systems which I should class as preventable, which now discharge into the river, and that the condition of the waters as to pollution was such as to lead the commission to conclude that the time was not far distant when the capacity of the water to receive continued amounts of pollution would be reached.

Q. Did you concur in that conclusion?

A. I did.

Q. What were the bases or premises upon which you
699 reached that conclusion?

A. They were of two sorts, first the observations of the water itself and second, consideration of the polluting causes which we knew from other evidence were being received by the waters.

Q. Now, what examinations of the water itself did you personally make?

A. None except ocular.

Q. Where did you make your inspections?

A. At substantially every point of importance and a good many points of no importance around the different Boroughs of New York and along the Hudson River shore of New Jersey, and over considerable portions of Newark Bay and around the Kills and in Great South Bay, and in the western portion of the Sound.

Q. Did you extend your observations to any point beyond the immediate shore line?

A. Oh, yes.

Q. Where?

A. Into the water.

Q. Well, what did you see in the water, where did you see it?

A. Our observations were—the answer to the former question,—were in the water, not on the shore.

Q. At the shore line I asked you. I did not expect you to see water on dry land.

A. They were not on the shore line; they were off the shore line.

Q. How far from the shore line.

A. Well, various distances.

Q. Well, approximately?

A. Well, the whole width of the North River.

Q. You examined the whole width of the North River, did you?

A. Yes.

Q. Well, now, what did you find from inspection to be the conditions at the middle of the North River?

A. Fairly good at some stages of tide and very unsatisfactory at others.

700 Q. In what respect unsatisfactory the other times?

A. Confining the answer to specific places which you have siezed on, the North River——

Q. I did not seize on it; you mentioned that.

A. I mentioned it as the first of a great number and you interrupted me before I proceeded with the others I found the conditions there were for the upper North River most objectionable from floating material; coming further south, however, toward the Battery, I found the conditions to be extremely bad as to sewage contamination on both shores and reasonably free from such ocular objection in and near the center of the stream.

Q. When you say "reasonably free" why did you qualify it, and on what do you base your qualifications?

A. Because I could not say free and I could not call it obnoxious at that time.

Q. Well, what did you see there that you detected and recognized as sewage?

A. Occasional evidences of solid matter floating in sewage but which were not very common in the center of the North River.

Q. Could you identify them as sewage and not as the offal from some ship or boat?

A. I identified them as sewage; I did not trace them back to their source whence they were discharged from.

Q. Are you a bacteriologist?

A. No, sir.

Q. Are you a chemist?

A. No, sir.

Q. Neither one nor the other?

A. No, sir.

Q. You say, as I remember it, that in your judgment the Bay of New York is liable soon to be polluted beyond—so as to be

701 intolerable, is that your opinion?

A. I do not remember that I used just those terms; if you will read the answer perhaps I can identify it.

Q. Do you think the condition of the Bay of New York would soon become intolerable?

A. At an early date, if the same rate of contamination continues. That is my belief.

Q. At what date did you fix it?
A. It is impossible to set a date.
Q. Within what limit of time will you fix it?

Mr. O'Sullivan: One moment; I wish to direct counsel for the defendants that he is now treating this witness as his own expert, and dealing with conditions of today, while this witness has entirely testified so far to conditions that he found between the years of 1903 and 1905.

Mr. Riker: Answer the question, Professor, please.
A. Well, it — difficult to fix a limit of time for a thing of that sort, but I should say that if the same rate of increase of pollution continues, that has occurred in the past, and if the Passaic Valley Sewerage project is permitted to be carried out, that in ten years we shall consider that the conditions are intolerable.
Q. Yes. Now, what will make the conditions intolerable and in what respect will conditions be intolerable?
A. Well, in the first instance they will be intolerable because by that time we shall have *our* increased our standards of demand and standards of purity and standards of beauty above what we do now.
Q. That is prophecy?
A. That is prophecy, but I am willing to venture it. In the second place, the rate at which the drainage area of the
702 Hudson and the streams tributary thereto is being increased by the inevitable and unavoidable pollution coming from its population which is increasing at such a rate as that unless relieved by the stopping of all avoidable pollution, we shall have a condition in the waters when they will no longer be able to assimilate even as they do today the burden of pollution poured into them.
Q. What percentage of pollution do you think as a percentage will cause that condition to arise in the waters of New York Bay?

Mr. O'Sullivan: Objected to on the grounds of ambiguity.
The Commissioner: Note the objection.

The Witness: I am not familiar with the standard or the quant-ative expression of pollution which you seem to have.
Q. Can you answer that question?
A. Not in the form you ask it, no.
Q. Well, you can't answer, as I understand you?
A. The question is open to an answer.

Mr. O'Sullivan: I object to any discussion on this question for the reason the question is clearly ambiguous, the percentage not setting forth the relation or ratio between any two fixed quantities of any kind.

Q. You can't answer the question?
A. Not in the form asked, no.
Q. What is the percentage of the pollution of the waters of New

York Bay, or what was the percentage during the existance of this commission?

A. I think—I have the same difficulty in answering that as I had to the other question. I am not familiar with the standard
703 which you inject into your questions.

Q. What standard did you place as fixing the purity of the water of New York Bay?

A. I know of no one quantity standard that can be applied to the whole question of pollution.

Q. Do you know any standard that can be applied?

A. I know various standards that may be applied.

Q. Well, state some of them?

A. Various standards which may be applied to indicate in their aggregate the conditions of water as to pollution.

Q. Well, will you now state those that you now think of?

A. One standard is the percentage of dissolved oxygen; another standard is the presence of materials furnishing odors from the water; another standard is the measure of objectionable optical appearance of the water; another standard is the measure of suspended matter as effecting the clearness or tu-bidity of the water; another standard is the evidence which the water presents when brought against the shore that is to say the cleanliness or foulness of the shore docks and wharves and rock and other solid materials exposed to the waters, and there are other standards also. And altogether they may be used or must be used if a general result is to be ascertained as to the degree of pollution.

Q. Have you made any personal attempt to determine, or did you make any personal attempt while serving on this commission, to determine the amount of dissolved oxygen in the water of New York Bay as a whole?

A. I did not.

Q. Did the commission to your knowledge make any such attempts?

A. We made several observations during a portion of the
704 year. Those observations either have been or will be reported by the gentleman who conducted them.

Q. You made none?

A. No.

Q. Did you attempt to determine the comparative purity of the waters of New York Bay?

A. Does your word "Comparative" relate to the waters at different places, at any one instant, time?

Q. Compared with any body of water, with the ocean waters? Did you make any attempt to determine the comparative purity or impurity of the waters of New York Bay as compared with the ocean, for instance?

A. Yes, the commission did so.

Q. Did you personally?

A. Personally I did not, no.

Q. And in doing that did they attempt to determine the relative amount of dissolved oxygen in the two waters?

A. That was one of the series of observations.

Q. Are they published anywhere ?

A. I cannot say at this moment, whether they are published in the supplemental report of the commission or not.

Q. They are not in your main report though?

A. No, sir.

Mr. O'Sullivan: We will put that data in later through Doctor Soper and Doctor Jackson.

By Mr. Riker:

Q. Now, the visible impurities along the shore, did you trace them to their source?

A. In many instances, yes.

Q. Did you find that they were matters suspended in the water as a whole that is to say, were they uniformly suspended in the waters of New York Bay?

A. Some portions of the solids which appeared on the shore contiguous to piers were of that nature, others were of more local source.

705 Q. Well, now, what was the part that you identified as being part of that general and uniformly suspended matter in the water of New York Bay, which you found on the shores?

A. Well, taking for instance the matter of sewage; where the sewage came from the general body of water and presumably was contributed by various scattered sources, the material was always in a finer state and in a more advanced state of decomposition. On the other hand, where the sources were more local and immediate, the material was of more recent discharge and not so finely divided.

Q. You found and detected by your own observation, sewage material which you identified as being generally suspended in the waters of New York Bay, did you?

Mr. O'Sullivan: One moment; read the question.

The question was read by the stenographer.

The Witness: Well, so far as we could determine it- original source from the two indications which I gave you as to fineness of subdivision and to apparent age since it was discovered.

Q. That is all that you based your judgment upon, is it?

A. That is the only way we found no tags on the sewage at all.

Q. Did you find corresponding sewage in the middle of New York Bay?

A. We did not fine the finer material there, we were only able to detect when it was visible at all the coarser material, naturally.

Q. In reading from some pamphlet you appear to adopt the phrase that the plan of the New Jersey Commission was to dis-

charge crude sewage—the present plan is to discharge crude
706 sewage into New York Harbor. Do you mean that?

—. I do not know what you refer to when you say some pamphlet.

Q. Well, in reading, in testifying you used the words "that the present plan was to discharge crude sewage into New York Bay." Do you know whether or not that is so?

A. If I used that term I did so to read the plans and recommendations which I was then speaking of.

Q. The present plan then was, as used by me, in my question, referred to the past as being present?

A. We should speak of it now as the past, certainly.

Q. Well, do you know what the present plan of the New Jersey Commission is?

Mr. O'Sullivan: Objected to.

The Commissioner: Note the objection.

Mr. O'Sullivan: Objected to on the ground that this witness—all his testimony is covered within the years 1903 to 1905.

The Witness: I have no official knowledge of the present plans of the Passaic Valley Sewerage Commission.

Mr. Riker: I did not ask you if you had any official knowledge I asked you if you have any knowledge of the plans?

The Witness: Why, of hearsay information, informal; I heard informal discussion, but I have nothing that I should dignify with the state we term knowledge.

Q. And have you made no effort to get any knowledge of the plan of the present—the present plan of the Passaic Valley Sewerage Commission?

A. Yes.

Q. And have not succeed-?

A. And have not succeed-.

707 Q. To whom have you applied?

A. I suggested to the representative of New Jersey, at a conference held in their efforts to reach a settlement of this matter amicably in order that we might be advised as to what their present intentions were, we should be supplied with a pamphlet which is said to exist showing the present plan proposed by the Passaic Valley Sewerage Commission. To that we were answered that those were matters that pertained strictly to the work of the commission itself and were not available for general examination.

Q. Who told you that?

A. Well, I think it was the chief engineer of the—Resident Engineer of the Metropolitan Sewerage District. I think his name is Taylor, Mr. Taylor. I think it was Mr. Taylor who told me that.

Q. Have you now familiarized yourself with the stipulation between the State of New Jersey and the United States with reference to the construction of this sewer?

A. Yes, sir, somewhat.

Q. Then you do know something about the plan of the Passaic

Valley Sewerage Commission, do you not?

A. That reveals very little of the plans; whatever is there given is tentative and is subject to alteration without any breach of contract.

Q. That is to say the specification is subject to alteration in order to reach the result stipulated for, is it not?

A. The specification as to constructive features is open to deviation and modification without breach of contract.

Q. Provided the results are arrived at?

A. Provided the results are arrived at, yes.

708 Q. Now, in the menace to the waters of New York Harbor, which you have said, as I remember, is likely to become intolerable with in a space of ten years, provided the conditions supervene, which you have prophecied, do you think that the construction of the Passaic Valley Sewerage Commissioners' Sewer will add provided, as a result of its operation, there is an absence in New York Bay of visible suspended particales coming from Passaic Valley Sewage; that there is an absence of deposits in New York Bay coming from Passaic Valley Sewage; that there will be absence in New York Bay and its vicinities of odors due to the *ptrefication* of organic matters contained in the Passaic Valley Sewage thus discharged; that there will be a practical absence on the surface of New York Bay of any grease of color due to the discharge of the Passaic Valley sewage at the di-persion area or else where, that there will be no injury to the public health occasioned by the discharge from the said sewage into the Bay of New York in the manner proposed and no public or private nuisance will be created thereby; and that there is an absence of injurious effect upon the property of the United States situated in the Harbor of New York, and that there is an absence of the reduction in the dissolved oxygen contained on the waters of New York Bay resulting from that discharge, why do you think that that sewer will contribute in any way to the disastrous effect you have prophecied?

A. That question involves so many points of indetermination, that I am unable to give an answer to it.

Q. Cannot carry them in your mind?

A. I can carry them in my mind, al- right.

709 Q. Now you don't feel that you can say whether or not discharge resulting as is indicated in these specifications is likely to contribute in any marked degree to the pollution of New York Harbor?

A. Why, if it were possible to obtain that utterly impossible series of results,—when I say impossible, I mean of interpretation and identification of those various objectionable conditions as traceable to the New Jersey sewer, why then I should say that I should not anticipate the discharge from the Passaic Valley sewer would add rapidly to the increase of pollution.

Q. Would it add at all to the observable pollution of New York Harbor?

A. Undoubtedly.

Q. In what respect?

A. In respect more particularly to the matters which went into

minute subdivision and minute suspension, and also in respect to the matters that go into solution. It is utterly impossible to discharge the amount of sewage herein proposed foreign—from one hundred to three hundred and fifty millions gallons of sewage every day into the harbor of New York without adding materially to the load or weakening the purity, whether that pollution exists in the form of dissolved matter, of whether it exists in the form of finely divided solids, too fine to be visible to the ordinary visual tests.

Q. Well, where would the effect of these finely divided particles show themselves?

A. They would show themselves in every part of the Harbor to which the tidal movement carried the sewage, the tide-way up as high as at or near Yonkers down to near the Narrows.

Q. Is the presence of those finely dissolved particles of matter consistant with absence in the reduction of dissolved oxygen
710 contained in the water?

A. I did not use the words finely dissolved.

Q. Well, what did you use?

A. Finally divided.

Q. Is the presence of these finely divided particles of sewage matter consistant with an absence of reduction in the dissolved oxygen contained in the waters of New York Bay?

A. Oh, yes, you may have in one particle of water a particle of sewage, and in a particle of water not very far away you may have a surplus of oxygen. Unless we could secure absolute perfect mixture of the materials we should not get the homogeneity conditions.

Q. But where wou fo-nd these finely divided particles would not there be a reduction of the dissolved oxygen?

A. Undoubtedly there would be in the particles of water immediately surrounding or very near the particles, but even at a short distance away there might be a surplus, and I assume that these specifications are written with respect to their reasonable means of verification and testing, and it would not be possible to test every particle of water adjacent to solid sewage and far removed from it.

Q. Well, speaking of reasonable interpretation; how do you suggest as an expert that it would be possible to select the water which had the oxygen in it and reject the water which did not have the oxygen in it?

A. It would be utterly impossible, and that goes to the imperfection of the present stipulation.

Q. I have asked you whether if the results stipulated for are produced, as a fact, in your opinion, the waters in the harbor will in any respect be polluted by the operation of this proposed sewer. Now, what is your answer to that?

711 A. I think I have answered that some time ago.

Q. Will you answer it again after considering the matter further?

A. I have given no additional consideration to it than I did then.

Q. You think that if as a fact there is no reduction in the dissolved oxygen in the water of New York Bay, there still may be pollution?

A. Assuming that the water and the organic material are thoroughly dissolved and thoroughly mixed, then I admit that if the condition of the organic matter shows no reduction of dissolved oxygen, that the result would be harmless, but I deny the possibility of reducing those presumptive conditions.

Q. You deny that it is possible by any system of sewage purification and disposal to produce those results, do you?

A. Oh, no.

Q. Well, then, what do you mean when you say that you deny that it is possible to do it?

A. I mean that if the specifications were more explicit as to the manner in which the tests should be made and if the specifications were to cut loose from the impossible conditions that they shall be traceable to the Jersey shores, then it would be entirely feasible to apply the tests.

Q. Where do you see that attached to the condition that they shall, be traced to them?

A. Almost every one of those condition*d* has the loophole that in order to prove the contract forfeited or broken, violated, it must be shown reasonable—to the reasonable conclusion that the cause originates in New Jersey.

Q. That is your interpretation of the stipulation, is it?

A. Yes.

712 Q. It does not say so does it?

A. In substance, yes.

Q. Will you point as I read them, where it says that they must be traced to that, and that they shall not be occasioned by the sewage in the——

A. Yes, sir.

Q. (Reading.) There will be absence in New York Bay of visible suspended particles coming from the Passaic Valley Sewage?

A. That means traceable backwards to the Passaic Valley Sewage.

Q. That is your opinion?

A. Yes, distinctly.

Q. You do not recognize the question of good faith on the part of the State of New Jersey stating there shall not be sewage discharged into New York Bay?

A. I *regonize* that, but I recognize also the good faith of New Jersey *il*imted to the compliance with the specifications, which in my opinion, are unenforceable.

Q. Do you also find the same thing in this stipulation that there will be absence in New York Bay and vicinity of odors of purification of organic matters contained in the Passaic Valley Sewage thus discharged?

A. I think there is the same impossible element of verification and enforcement there.

Q. You assume that it is a question of proving that New Jersey has failed to live up to its stipulations, do you?

A. No.

Mr. O'Sullivan: I object to it.

The Commissioner: Note the objection.

The Witness: It is a question of proving whether the odors come from New Jersey Sewage or New York Sewage, or come from Hoboken Sewage or Staten Island Sewage, and the burden of proof is on the present complainant.

713 Q. And the whole burden is on the person agreeing to do a thing, is it not, or don't you recignize that?

Mr. O'Sullivan: I object to this line of questioning which involves judicial construction and subtleties of ethics.

The Commissioner: Note the objection.

Q. As an expert, in your opinion, is it or is it not possible by suitable treatment of sewage to absolutely comply with the stipulation without regard to the question of whether you are found out or not?

A. Yes.

Q. Now, in your dealing with the problems presented by the New York Bay Pollution Commission, you had under consideration its feasibility of ocean disposal of sewage, did you not?

A. Yes, the general consideration.

Q. Under general consideration. And you have testified that you concluded that systems of purification were not feasible?

A. No, I have not so testified.

Q. Well, let's hear just what you did say?

A. I said that the report of the commission was that as between two possible general lines of remedy, it seemed then that the method of ocean disposal possessed advantages or was preferable.

Q. Why?

A. At that time and which time the progress of the development of modern methods of sewage disposal on a large scale had not advanced as they have today, that seemed to be the more feasible and economical of the two methods.

Q. Economical for whom?

A. Economical for the tax payers.

Q. For what tax payers?

A. For the tax payers who had to bear the burden.

Q. You were considering the interests of the tax payers of New Jersey?

A. Certainly, as well as New York.

Q. And as an economical proposition at that time was it
714 a possibility for the Borough of Manhattan to dispose of its sewage and purify it to meet the specifications in this article which I have read to you?

A. I did not make a determination on that question.

Q. Well, what do you think about it now, is it possible?

A. I have made no determination of that question, even today.

Q. Was it not because of your belief that it was economically impossible for the Borough of Manhattan to comply even with the specifications of the character embodied in the one that I have read to you, that led you to recommend the ocean disposal?

A. You will recall at that time that we had no specifications that you had shown us with which to compare.

Q. Well, with any specifications for disposal and purification of sewage?

A. No. It seemed to us then that as between the two alternate plans described, namely the adoption of frequent numerous disposal plants on the one hand and a general discharge from one *one* or more conters on the other, in to the ocean, at that time, the latter seemed to be the more preferable of the two plans. But I wish again to call attention to the fact that my report states that, what I now repeat, that that was a general result reached after a casual study of the question when we had no opportunity, no appropriation for making extensive studies, such as have since been made, and we were obliged to reach the best conclusions we could in a short time and with the absence of appropriation, practically, with which to study these questions.

Q. And you have, as an individual member of this commission no suggestions to add to those contained in these reports?

A. Well, that report was closed on March 31st, 1905, and I have no right nor desire to add to those conclusions now.

715 Q. You had not as an individual at the time that this report was made?

A. Not at that time.

Q. How much investigation did you make into the question of installation and operation of individual systems of sewage disposal for each district or municipality?

A. Well, we went into some tentative estimates as to the feasibility and the burden of cost of carrying out that.

Q. Well, from an engineering point of view it is all feasible, isn't it?

A. No.

Q. Why not?

A. Because the engineering point of view includes the economical point of view as the cost is one of those essential elements, and the cost might easily be prohibitive. The same is true also of the ocean disposal which might, be its very burden of cost, be placed beyond the reach of some, if not many, of the communities concerned.

Q. Well, perhaps I did not distinguish closely enough; theoretically and scientifically, it is not beyond the reach of possibility to install and operate individual systems of sewage disposal for each district or municipality, is it?

A. Do you eliminate the element of cost?

Q. I certainly do?

A. Oh, it is entirely feasible.

Q. What?

A. It is entirely feasible. We can buy the Hudson Terminal building and replace it by—and put up, a sewage disposal plant, but no engineer considers that within the appeal of reason.

Q. The prohibition rises from the fact that it will cost more than can possibly be paid for?

A. The selection of the preference of the two methods took into account, the element of estimated cost as well as thoroughness of accomplishment.

716 Q. Now, where was it that the estimated cost—in what part of the district was it that the estimated cost became prohibitive?

A. Why, I did not say prohibitive, I said rendered the latter plan the preferable of the two.

Q. Well, then, in which municipality did the element of cost render the ocean disposal plan probably?

A. Well, as we believed at that time, it was generally true of most of the population of the entire district. It is true of the suburban portions, lightly built up, and which had ample ground and at moderate cost for disposal, it was there rendered preferable on account of the sparseness of the population. Where the population was most concentrated, the alternate question arose that land for appropriate works was prohibitive on account of its cost.

Q. In your experience as a practical engineer, are you willing to say that the installation of individual systems of sewage disposal for the districts of the Borough of Manhattan will not result in a prohibitive cost?

A. I am not prepared to give an estimate on that question.

Q. Did you make any estimate of the cost on ocean disposal such as you have recommended?

A. Except in very general amounts and cases.

Q. Well, now, what data did you use in making your general estimate?

A. Well, we used the best available data as to the cost of subaqueous tunnels and the best available data as to the tidal motion outside the bar with respect to the distance that such tunnels would need to extend.

Q. How far did you conclude such tunnels would need to extend?

717 A. Well, a definite distance was not reached, but we reached the idea that it probably would not be inside of 5 miles from the bar.

Q. Five miles away from the bar of New York Harbor?

A. Yes.

Q. And the proposal is to tunnel out to that depth?

A. Not necessarily out to that depth, but to that distance.

Q. To that distance is what I intended to say; involved a tunnel to that distance?

A. Yes.

Q. And under the water of New York Bay?

A. When I said the bar, I should have said the Narrows, because we had in mind not so much the bar itself, as the gateway into upper New York Bay.

Q. You wish to amend that by saying the Narrows instead of the bar?

A. Yes.

Q. Well, how near the shore of Sandy Hook would your five mile limit place you?

A. Well, accor-ing to our ideas that was the minimum distance that a scheme of that sort should go.

Q. How near to the coast of New Jersey which is known as Sandy Hook, would your outfall be on the five mile limit?

A. That would depend on the direction of the five miles.

Q. How near would it be to Coney Island if you took the other direction?

A. Well, probably not over two or three miles.

Q. And there you think you can safely discharge the combined sewage of five million or six million people, do you?

A. I think that was the very minimum distance I stated, was the proposition that was advisable.

Q. That is the minimum?

A. That is the minimum.

Q. Isn't it much inside the minimum?

A. That is quite possible, yes, sir.

718 Q. Isn't that subject to all the criticism and more that you are making on the proposal of the New Jersey sewage commission?

A. It is certainly open to the criticism of uncertainly, because we made no careful surveys and estimates of the cost, in as much as we were not able to make them.

Q. Did this proposition involve anything but the discharge of crude sewage—any treatment?

A. You refer to the——

Q. (Interrupting.) Ocean disposal?

A. No, except the coarsest screenings to remove the foreign matter, strictly foreign sewage.

Q. Did you make and tentative estimates of the cost of such an ocean disposal sewer as you have indicated?

A. Well, not beyond the point at which we were able to compare roughly and generally the burden of cost of the two systems.

Q. Well, to what point did that comparison reach?

A. As I said before, it reached to the extent of determining very general measures of the cost of the two. The estimates of cost were based, as I said, on our best knowledge of the cost of subaqueous tunneling taken in conjunction with the distance to be tunneled.

Q. And how far did you estimate the tunnel to extend, that five mile distance beyond the Narrows?

A. Why, the degrees by which we reached the conclusion that tunneling would still be the better of the two—I do not recall; it was something beyond the minimum and less distance that the maximum.

Q. Now, will you state what your estimate of the cost of such a tunnel would be

A. I do not carry it in mind at all; I simply carry in
719 mind the fact that we concluded that the tunnel method of ocean disposal would be the most reasonable.

Q. Was it less than one hundred million dollars?

A. Well, I cannot attempt to be even as explicit as that.

Q. Was it less than two hundred million dollars?

A. I think I answered that; I think——

Q. What?

A. I think I answered that.

Q. You have answered as to one hundred million dollars; now I ask if it was less than two hundred million dollars?

A. I cannot undertake to give the measure of cost.

Q. You can give it within no limits at all?

A. If I fix a limit, I should be misrepresenting my own condition of mind even then, and much more so now.

Q. Would you say it was less than one thousand million dollars?

A. I do not think it is worth while to *take* about those figures; too speculative.

Q. Well, if you made an estimate of the cost, it must have been stated in figures, must it not?

A. At that time it was, yes.

Q. And you cannot recall within any limits at all as to what the estimate in figures was?

A. You recall that the result which we were after was an ascertainment as to which of the two methods was most entitled to worthy consideration of a more detailed source. Our result was obtained when we concluded that of the two the method of ocean disposal presented the more promising appearance.

Q. That was the subject that was particularly submitted to your charge, wasn't it, that ocean disposal?

A. Yes.

Q. And you have recommended it in this report?

A. To the extent indicated in my answer.

720 Q. And to the extent indicated in your answer you have recommended it?

A. Yes.

Q. And you did form an estimate of the probable cost of it?

A. I recommended it for further consideration.

Q. I ask you if you did not form an estimate of the probable cost of it?

A. At that time we did form an estimate of the probable cost.

Q. What was it?

A. I do not recall; I do recall that the burden of cost estimated was less than it was for the then estimated cost of separate disposal work.

Q. Well, can you state the then estimated cost of disposal work?

A. I can't at this time, no, sir; I can simply state that it was more than for ocean disposal.

Q. Can you refresh your memory by reference to any memorandum?

A. I probably have data at home which will enable me to be a little more explicit as to the estimates of that time.

Mr. Riker: Counsel assures me he expects to put this witness on the stand again and I——

Mr. O'Sullivan: Not tomorrow, because he is going up the State tonight and he won't be here Thursday or Friday, but he will be on the Stand later.

Mr. Riker: Then, at that examination, I would like to reserve the right to interrogate him on the cost.

Q. Now, Professor Landreth, as between the method recommended tentatively by you of ocean disposal at a minimum of five miles, discharge of crude sewage, roughly screened into the water at about that point, and the purification as is indicated in the purifications which I have read to you adopted by the United States Government and the State of New Jersey, which would
721 you think preferable for the whole district?

A. Do you eliminate the cost?

Q. Eliminating the cost, yes, sir,

A. I should say ocean disposal was, decidedly.

Q. Even a crude sewage disposal within a few miles of the New Jersey coast, you think is preferable to this purification scheme?

A. Well, I won't say a few miles; I will say the proper distance.

Q. What is the proper distance from the New Jersey coast?

A. That is one of the things that would need to be determined carefully, be more investigation that we did at that time.

Q. Do you think that a proper distance is ten miles from the shore?

A. I should say if you discharge sewage ten miles from New Jersey, the conditions of New York Harbor will be decidedly better than it will be under the operation of that agreement with the United States.

Q. Well, I would mildly suggest you take into consideration the shores on New Jersey in your ocean disposal, and ask you whether you think the shores of the State of New Jersey above Sandy Hook and Long Branch and Elberon, will be benefited by the discharge of crude sewage from the ocean disposal?

A. It appears to me on a hasty examination of your question that conditions in the open sea opposite the Jersey shore would be rendered less severe by this ocean disposal extending out we will say, and average of ten miles from the Narrows than there would even from the discharge of sewage from New York Bay, on account of the more effective mixing of sewage by the tidal currents, discharging into the ocean at that distance away.

722 Q. How far from the Jersey coast is ten miles from the Narrows, taking it at opposite Sandy Hoow, do you know? if you know?

A. Why, if ten miles from the Narrows would make it approximately five or six miles from Long Island shore, and five or six miles from the general New Jersey shore, six or seven miles, it would not leave it as far as that probably, from the point of Sandy Hook.

Q. Not so far; how far do you think?

A. Well, I could not say without referring to the map.

Q. Haven't you specified as a proper point of discharge of screenings and sediment and sludge as not nearer the line of the shore of New York than ten miles?

A. That is where you planned to take out a large proportion of the solids and discharge them directly as sludge.

Q. Haven't you specified that no screenings of any *any* character should be discharged within ten miles from the shore of New York?

A. I have not specified at all.

Q. Don't you think that is the proper distance at which they should be discharged?

A. Yes, sludge coming from a large disposal plant.

Q. Well, the sludge being discharged through a sewer serving the Metropolitan District of five million or six million people, crude, with the exception of rough screenings consisting of sludge and sediment, should be considered?

A. Well, I considered that the discharge of separate sludge, separated in a large disposal works and deposited ten miles out to sea, would be a great deal more obnoxious than if the entire contents of the sewer were sent out to that distance and the greater thoroughness of mixing would be accomplished.

Q. Do you think that that discharge, then, of the sediment of a sewer serving from five hundred thousand to one million six
723 hundred thousand people deposited as dry material, a distance less than ten miles from the shore, is more objectionable than the discharge of crude sewage carrying off the sludge with the exception of the roughest particles through a sewer serving six million people do I understand you to say?

A. I am drawing no comparison between dissimilar districts; my comparison there is between similar districts?

Q. Well, similar districts?

A. Various plans for the same district.

Q. Same district?

A. I made no comparison, I say, between the small district by one process and the large district be another process. You cannot introduce two paraboles into comparison very well.

Mr. Riker: That is all.

Redirect examination by Mr. O'Sullivan:

Q. What compensation did you receive from the State or the municipality or any other source for your services to the New York Bay Pollution Commission?

A. None whatever.

Q. And the appropriation was devoted to what purposes?

A. To the actual traveling and other necessary expenses and to the making of a comparatively small number of scientific observations, such as have been testified to by Dr. Soper, and will be further testified to by me.

Q. No part of that appropriation went to you as compensation for your services?

A. No, sir, certainly not.

Mr. O'Sullivan: That is all.

The hearing was then adjourned to September 21st, 1911 at 11 A. M.

Adjourned to September 21, 1911 at 11 A. M.

724 Supreme Court of the United States, September Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Before James D. Maher, Esq., Commissioner.

CITY HALL, NEW YORK CITY, September 21st, 1911, 11 a. m.

Appearances:

Thomas Carmody, Esq., Attorney General of the State of New York; William A. McQuaid, Esq., Deputy Attorney General, and Dr. William J. O'Sullivan, Special counsel for The People of the State of New York, Complainants.

Edmund Wilson, Esq., Attorney General of the State of New Jersey; Robert H. McCarter, Esq., of counsel for the State of New Jersey; Joseph Coult, Esq., and Adrian Riker, Esq.,
725 of counsel for Passaic Valley Sewerage Commission, Defendants.

Dr. O'Sullivan for the Complainants presented certificate from a physician in attendance upon Dr. Soper, certifying as to the inability of Dr. Soper to attend on account of illness, and not being able to present another witness, the Commissioner declared the hearing adjourned until further notice.

Adjourned until further notice.

726 Supreme Court of the United States, *November* Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK CITY,
November 22nd, 1911—10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances:

William A. McQuaid, Esq., Deputy Attorney General of the State of New York; Dr. William J. O'Sullivan, Special counsel for The People of the State of New York; Adrian Riker, Esq., of counsel for Passaic Valley Sewerage Commissioners, *De-* defendant-.

727 The Commissioner: Pursuant to the following order the hearings in the above entitled case are resumed.

(Copy.)

Supreme Court of the United States, October Term, 1911.

No. 4. Original.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
STATE OF NEW JERSEY et al.

On consideration of the motion to extend the time for taking testimony in this cause,

It is now here ordered by the Court that the time for Complainants to take further testimony be, and the same is hereby, extended to March 31st, 1912, that the defendants may take testimony between April 1st, 1912, and September 15th, 1912, and that the Complainants may take testimony in rebuttal between September 15th, 1912, and December 1st, 1912.

October 30, 1911.

A true copy.
Test:

[Seal of the Supreme Court of the United States.]

JAMES H. McKENNEY,
Clerk of the Supreme Court
of the United States.

728 GEORGE A. SOPER A witness called on behalf of the Complainants recalled for further examination, testified as follows:

Direct examination (resumed) by Dr. O'Sullivan:

Q. Dr. Soper, was the water of New York Bay shown to be composed of fresh and salt water in fixed proportions?

A. No, it is not.

Mr. Riker: One moment. The question is not identified as to how it is shown. I object because of the indefiniteness of the question.

Dr. O'Sullivan: I would direct Mr. Riker's attention to pages 349 and 348 of the witness' testimony in which he had testified somewhat on this question in that direction as to the percentage of both salt and fresh water. The pages that I direct counsel's attention to are of the witness' testimony taken when he was on the stand previous to today.

The Commissioner; Note the objection.

A. No, it was not. It changed with the season. In the Lower Bay it was found from about 20 per cent. to 100 per cent. sea water, according to the location with reference to sources of dilution and the amount of land water coming down the various large rivers and other tributaries of the Harbor. What seemed to be a fair average for the Bay, under ordinary conditions of weather and beyond the range of local dilution, was 75 per cent. The water of the Narrows was found to vary from 43 to 77 per cent. sea water. The majority of samples averaging about 65 per cent. sea water. At the Battery the samples ranged from 15 to 69 per cent. sea water, with an average in this vacinity which is taken to indicate the general conditions of the Upper Bay of about 45 per cent. The Lower Hudson was found to be the scene of
729 the widest variations in the proportions of sea and land waters. In the result of the analyses it is shown that the Hulson at Spuyten Duyvil ranged from an hourly average of 5 per cent. to an hourly average of 44 per cent. sea water for a whole day. There was sometimes as much salt at the Croton Point as there was at other times at the Battery, 33 miles nearer the sea. In fact the upper limit of the brackish water might vary anywhere between a point a little above Spuyten Duyvil and Poughkeepsie.

Q. Did you seek the causes of those differences, Doctor?

A. Yes. The cause of the difference in salinity was found to be a difference in the amount of land water flowing down from the Hudson and tempering the salt. In the amount, when the discharge of the river was at its heighth, large quantities of water came down and followed the sea water towards the sea, and in the summer and at some other periods of little rain fall, the sea water crept up the Hudson a long distance. As I have said, the range of salinity varies considerably between Yonkers and Poughkeepsie, depending upon the amount of land water coming. I might say that that circumstance affected the water, not only in the Lower Hudson, but also in the upper Bay and to some extent in the East River and other arms of the harbor.

Q. In your report of the New York Bay Pollution Commission, submitted to Governor Higgins, March 31st, 1905, the phenomena of the under-run is described on page 68. What do you mean by the under-run, Doctor?

A. By the under-run in meant current of water of greater salinity than the overlying water which creeps along the bottom of a tidal channel or river. It is a well recognized phenomena,
730 and has been described as existing in other harbors as well as in that of New York. The reason why the sea water keeps separate from the overlying wayer is that it is heavier. It is materially heavier. Sea may be from 2½ to 3 per cent. heavier than land water. This difference is very important to note in connection with studies of the pollution of tidal harbors.

Q. Did you attache any peculiar importance to the phenomenon of the under-run, as a member of the commission, of the New York Bay Pollution Commission?

Mr. Riker: I object to the question as to what opinion was drawn, that is not material.

The Commissioner: Note the objection.

A. Yes, I did. And noted the opinions of others in that respect. The character of the water at various depths was important to consider, for it seemed that sewage which settled from the surface of the water, or from points below the surface to the bottom, might be carried far inland by the under-run, for the under-run rose upward toward the interior of the country often without respect to the surface currents. Then, it seemed that there might be a considerable importance to be attached to the oxygenation or aeration of the water at the bottom. If a vertical circulation of water did not exist, it seemed difficult to understand how the lower water could be supplied with the oxygen which would be needed in order to oxidize and render innocuous the organic and nitrogenous matter which the sewage contained. The supply of oxygen in the water being dependant upon the atmosphere.

Q. Is that phenomenon of the under-run recognized by observers who make studies of the discharge of sewage and of brackish and salt water?

A. It is.

731 Q. And for any length of time?

A. My attention was called to it in the beginning by a report of Henry Mitchell, published in the report of the United States Coast and Geodetic Survey. Mitchell reported that at a *guaging* station, situated near Bedloe's Island——

Mr. Riker: I object to the detailing of the report of the gentleman, a gentleman whose direct testimony might be obtained.

The Witness: I think Henry Mitchell is dead.

Dr. O'Sullivan: He has been dead many years.

Mr. Riker: Very well. I object on the ground that testimony as to what this gentleman said is not evidence in this case; it has not been properly proved.

Dr. O'Sullivan: The question is pressed and an answer required on the ground that these observations were made at the instance of the National Government to determine the various conditions that this witness is testifying to, and as his knowledge is predicated upon the observations of others as well as his own direct observations, and for that reason the question is pressed, and an answer required.

Mr. Riker: On the statement of counsel that these are reports in the possession of the Government, I object to it on the ground that evidence by this witness is not evidence of those reports.

The Commissioner: Note the objection.

A. I was giving my reason why my attention was called to the phenomenon of the under-run. Mitchell, in the Government report to which I have referred, states that at a *guage* station established by the United States Government between Bedloe's Island and Governor's Island in 1858 found that the velocity of

732 the under-run moving up the river was found to exceed the velocity of the surface current moving toward the sea. The

daily progress of the un-er-run was said to have been 21 miles at a depth of 68 feet.

Q. So that you had two currents moving in opposite directions?

A. It was so reported.

Q. And the under current moving with a greater velocity than the surface current?

A. Moving without respect to the surface current, and moving landward.

Q. What was the daily landward progress of the under-run?

Mr. Riker: One moment. I object on the ground that this witness has not testified to any observations made by himself.

The Commissioner: Note the objection.

Mr. Riker: This question seemed to call for something from his own knowledge.

Dr. O'Sullivan: The question is pressed for the reason that the witness has made, and has testified to having made, direct observations of his own, and he finds corroboration in the earlier observations made at the instance of the National Government.

A. Mitchell reported daily progress of 21 miles.

Q. When was the term "Digested" first used in connection with this problem of sewage disposal, and what does it mean?

A. It was first used I think by me in my long report to the Pollution Commission.

Q. In what year?

A. In March 1905. On page 70 of the report of the New York Bay Pollution Commission to the Governor of New York State will be found *in* a reference to it. It was used to indicate the assimilation of sewage by the water and the animals and plants in
733 the water. The assimilation process was closely associated with the oxidation of the sewage impurities, and it was stated that the bacteria played an important part in effecting the result. It was also considered that the digestive capacity of water depended largely of the amount of oxygen which the water contained. If a sufficient supply of oxygen was not present the sewage would putrefy, giving off objectionable odors and other consequences.

Q. Did you fond sea water had a larger or a smaller digestive capacity than river and lake waters?

A. It was considered that compared with fresh water streams, or the ocean, that the conditions in New York Harbor were not favorable for the disposal of sewage by digesting or assimilation. The constant changing proportions of sea water and land water were prejudicial to the existance of a permanent fauna and flora, and the phenomenon of the under-run indicated that there was an absence of virtical currents which were needed to carry an adequate supply of oxygen to the depth. The amount of sewage which could be safely discharged in land water was found to be no measure of the amount which sea water could assimilate. My attention in studying that question was attracted to results of experiments carried on by Harry W. Clark for the Committee on the Charles River

Dam at Boston, in which he stated that salt water normally held less oxygen than land water, and pointed out that when the oxygen was exhausted, putrefaction set in with the production of specially offensive odors in the salt water.

Q. What condition did you find to be and indispensable preliminary to digestion, Doctor?

734 A. Diffusion. Before sewage can be assimilated by water, before the oxidizing process can be carried on satisfactorily, it is necessary that the sewage shall be diffused or mixed with the water which contains the oxygen, and which otherwise has power to aid in its assimilation.

Q. In the course of these studies, did you make an estimate of the amount of sewage and other drainage being discharged into the harbor?

A. Perhaps I should have made my answer to the last question complete.

Q. I withdraw that question.

A. Perhaps I should say that great importance attaches to the matter of diffusion, as a necessary preliminary to digestion, and that the absence of vertical currents, the stratification of different degrees of salinity which seem to exist as the result of these studies, indicated that the water of the harbor was unfavorable to the disposal of sewage.

Q. In arriving at that conclusion, did you make an estimate of the amount of sewage and other drainage being discharged into the harbor?

A. Yes, an estimate was made of the amount of organic matter discharged into the various parts of New York Harbor.

Mr. Riker: I move to strike that answer out as not responsive. The question was whether he made it.

The Witness: I made the estimate. It was impracticable to tell with exactness by means of analyses, and it was for that reason that the estimate was prepared. The estimate was made by taking the quantity of sewage that was discharged into the waters of New York Harbor, found to be 455,000,000 gallons for 24 hours. The amount of drainage due to rain fall is estimated on the basis of 42 inches of rain per year, and a run-off of 75 per cent. over

735 an area of about 162 miles. This rain fall amounting to 243 million gallons, added to the volume of sewage together made a total of 698 millions gallons of drainage wastes which the rivers in the immediate vicinity of New York and the harbor receive daily. There were no data to show the composition of this drainage, but it was considered that if its composition was similar to that of Worcester, Massachusetts, the only American city whose mixed house and street sewage has been carefully analyzed, there were one and one half tons of solid dry sludge for every million gallons of sewage and drainage, or 1047 tons in it all. Of this about one half was considered to be organic matter. In short about one thousand tons per million gallons of sewage was the estimate.

Q. Did you reach conclusions bases upon the analytical work

concerning the condition of the harbor and its capacity to receive sewage?

A. Yes. I consider as a whole that Upper New York Bay was not being taxed beyond its capacity at the time, nor that it could not digest considerably larger quantities of sewage than were being discharged into it, providing the sewage was added properly. That is, that a sufficient number of outlets were sufficiently far apart. What would happen if a large amount of sewage were to be discharged at a single part, is not ascertainable, but I felt there was reason to believe that it would not be disposed of without the production of conditions which would be very objectionable, if not intolerable. The chief danger seemed to be that the sewage would not commingle promptly with the water surrounding it, in which event it might be carried to inhabited shores, creep up the Hudson with the underrun, or rise to the surface and there form an unpleasant discolored area, as exists in Boston.

736 Q. When you say Boston, you mean the harbor of Boston?

A. I mean the harbor of Boston.

Q. That is the only place where the sewage is discharged in Boston, is it not, in the harbor itself?

A. Well, let me understand your question more fully.

Q. I withdraw the question.

A. I referred in using the term Boston to the three main outlets in Boston Harbor, at which there is discharged the sewage of most of the inhabitants of the Metropolitan District of Boston.

Q. In your studies as a member of the New York Bay Pollution Commission, did you take into consideration the character of the industries which might be affected by the pollution?

A. Yes.

Q. Will you please state them?

A. It was considered that an excessive pollution of the Harbor would affect practically every industry in the port, but a few of the main industries immediately connected with the water, were inquired into in order to obtain an opinion as to what industries would be most likely to be affected first and most seriously. The shad fisheries were considered, as were the shell fish industries. The passenger transportation business and the business carried on at bathing beaches by means of excursion boats.

With respect to the shad fisheries, it was found that the most important localities for shad fishing were in Westchester, Ulster, Dutchess and Columbia counties, up the Hudson River. There were comparatively few fish caught by people of the City of New York, but in as much as all the shad which brought revenue to the people of the State had to pass through the Harbor, any excessive

737 pollution of the Harbor which might injuriously affect shad would affect that State industry. My investigation of the question brought out the fact that shad was sometimes caught on their way through the Harbor which when cooked tasted strongly of trade refuse, but the extent to which the shad industry was being injured at the time of the investigation could not be accurately determined. It was probable that all the fish which were caught up

the State were not of an unpleasant flavor, as those which fell under my personal knowledge—and I had some personal knowledge, in this connection, going out in a small boat to nets in the Harbor and getting fish and taking them home and having them cooked.

Q. Did you make any investigations concerning the extent, location and value of the oyster industry in our harbor waters?

A. Yes. I undertook to find where the shell fish beds were located, and determined the number and value of oysters taken each year from this vicinity and to get an estimate of the importance of the industry. That was done in the following manner: the Bureau of Shell Fisheries of the Forest, Fish and Game Commission has authority from the State of New York to issue leases of State land under water for the purpose of shell fish culture, and when land is leased record of the fact of the location of the land is kept by the Bureau of Shell Fisheries. The results of the surveys in the possession of the Bureau examined by me and from the maps of land leased for oyster culture I prepared a map for the purposes of the Pollution Commission. I took that map to a number of the largest oyster producers in the vicinity, and asked their criticism and advise in making such corrections as seemed desirable. I found that at the time of the investigation, the year 1905, that there were
738 small sources of oysters in Upper New York in the vicinity of Robbins Reef. Upper New York Bay once supported what was thought to be exhaustless beds of oysters, but they had nearly all disappeared. Some persons said the oysters had disappeared because of pollution, but it seemed more reasonable to conclude that the beds had been exhausted be excessive raking. At the time of the investigation the neighborhood of Robbins Reef was still supplying some seed oysters and some oysters of marketable size, but the growths were not satisfactory to the oyster men. Attempts to raise oyster seed in the neighborhood of Piermont in the Lower Hudson, just above the palisades had been made by a large firm of oyster dealers, but without success. There opinion was that the water was too polluted. The chief sources of oysters in New York Harbor were found to lie below the Narrows. In addition to the beds I have mentioned, there were some beds in Newark Bay and some in the Staten Island Sound so called, or Arthur Kill, but the quantity of oysters produced for market above the Narrows and above the mouth of the Raritan River were small as compared with the quantities raised below the Narrows. The shore off the south side of Staten Island was one of the principal sources of oyster culture. Jamaica Bay was another. I found some conflicting information when I sought to ascertain the quantity of oysters raised in Lower New York Bay. The prominent oyster men, some of whom were doing business in that vicinity, said that about 500,000 bushels of oysters were taken from the Staten Island beds in the Lower Bay each year.

Mr. Riker: I move to strike that out as hear-say.

739 The Witness: The Bureau of Shell Fisheries of the Forest, Fish and Game Commission estimated the quantity at more than four times this.

Mr. Riker: I move that *the* be stricken out as hearsay.

The Commissioner: Note the objection.

The Witness: The United States Commission of Fish and Fisheries estimated the yield at about three hundred thousand bushels for the year 1901.

Mr. Riker: I move that that be striken out as not the best evidence.

The Witness: The value of those oysters is commonly taken at $1 a bushel, although they frequently sold for a higher price.

Mr. Riker: I move that that be striken out, as it appears that this witness has not made himself an expert on the prices of oysters.

The Commissioner: Note the objection.

The Witness: Some clams, soft clams and hard clams were taken in the same localities as the oysters, but the only estimate of the quantity of clams which could be obtained was from the United States Commission of Fish and Fisheries, which placed the annual output at 21,900 bushels.

Mr. Riker: I move that that be striken out as hearsay and not the best evidence.

The Commissioner: Note the objection.

The Witness: A table was prepared giving the details of the oyster business as officially reported by the United States Government authorities in charge of that subject. That table included a statement of the number of persons engaged on vessels fish-
740 ing and on vessels transporting the product, engaged on shore or in small boat fisheries, and the number of parsons, essentially shore men, connected with the production and sale of the oysters in large quantities. Also the number and value of vessels fishing the tonnage of vessels fishing, and the value of the fishing outfits. Also the tonnage and value of boats and vessels engaged in transporting; the number and value of apparatus employed in dredge tonguing and raking and the number and value of apparatus engaged in what was termed essentially shore fisheries. Also the value of shore and accessory property, and the total investment. This for Richmond County, which includes Staten Island and for the year 1901, the statistics collected by the United States Commission of Fish and Fisheries. Appended to that tabu*a*l*t*ed statement of detail was on account of the product taken, in bushels, and the value of the clams, that is *is* hard clams, from public reefs, oysters for the market from private areas, seed oysters from public reefs, seed oysters from private areas, with appropriate summaries of total production. The statictice thus mentioned by me did not include the whole product of shell fish from New York Bay nor from Lower New York Bay. There were small oyster grounds in the vacinity of Gravesend Bay, and extensive clam grounds in the same locality, and some shell fish were taken from the lower Bay in the vicinity of the Horse Shoe near Sandy Hook. I estimated that probably five hundred thousand bushels of market oysters were taken annually

by citizens of New York State from the waters of the Harbor within the limits of the State, and practically the same quantity of shell fish from practically the same waters by the people of New Jersey.

Q. Doctor, what conclusion did you arrive at as to the
741 pollution of these oysters and oyster beds based upon the analyses made by your commission prior to 1905?

A. I concluded that most of the oyster grounds in the lower Bay were not as yet dangerously polluted, but that those that were taken from the contaminated water were practically certain to be contaminated themselves. There were two matters to be considered from the standpoint of pollution of those oysters. There was the chance of pollution by sewage materials carried to the beds where the oysters were grown from sewers at a considerable distance, and there was the chance that the oysters after being removed from their growing beds would be polluted by being immersed for a time in creeks and estuaries w-ere the oysters were after placed in order to make them of better appearance for the market. It was found that many of the places where the oysters were immersed were polluted by sewage in a dangerous degree. I am speaking of the oysters from New York Harbor. I should perhaps say that the oyster grounds in Jamaica Bay have not been included in my remarks. The sources of shell fish *fish* in Jamaica Bay are of considerable interest, but were not included in the studies of the Pollution Commission, to which I am referring in my present testimony.

Q. The areas where these oysters are immersed, as you have described, Doctor, have they got a popular name for such areas?

A. The oysters after being removed from their growing beds are immersed in creeks and estuaries which are customarily termed "Drinking grounds" or "Drinking places," and the process of immersing the oyster for a brief period in order to improve its appearance before putting the oysters on the market, is termed "drinking." It is a process of drinking. Oysters, although they
742 are immersed, do not drink. The process is one of osmosis. The water in which the oysters are placed is always less saline than the water in which the oysters have been grown. The result is that the oysters absorb through their tissues the less saline water more rapidly than the- can get rid of the more saline water, with the consequence that there is a swelling of the tissues. The whole oyster becomes larger in appearance, whiter, and to some persons more appetizing.

Q. So that in the osmotic process the endosmosis surplus gives rise to the swelling?

A. Yes.

Q. Did your commission and you yourself at the time investigate the passenger transportation business and undertake to determine how ferry companies might be affected by this pollution of the Harbor?

A. Yes, it was observed that the business of transporting passengers across the Bay and other rounds of the Harbor was large and increasing. It was found that many of the—most in fact of the passengers were commuters who do business in one part of

the city and live in another or in the country, and they move back and forth every day on the boats of the ferry companies. It was believed that the pollution of the Harbor if unrestrained, might affect the business of the companies engaged in transporting passengers in these waters. The number of passengers would decrease, if the public health was endangered by the trip, or if the water became markedly offensive to the sight or smell. The extent of the business of transporting passengers across the harbor was investigated by me by going to the office of the United States Steamboat Inspection service and obtaining a statement as to the number of passengers carried by the principal ferries in New York and vicinity in the year 1903. It is the business of the United
743 States Steamboat Inspection service to collect such figures, and I prepared a table for my report to the New York Bay Pollution Commission in 1905, giving the route and name of each ferry company and the number of passengers carried in the year 1903. The total number of passengers was 194,161,515 and of this total about 8,811,000 traveled directly across the center of Upper New York Bay.

Q. Did your investigations extend to the business of conducting excursions on the water, and of maintaining bathing beaches?

A. Yes, the excursions and bathing beaches were studied with the following principal results: the information as to numbers of passengers carried was obtained from the United States Steamboat Inspection service, whose business it is to collect such facts. The total number of passengers carried by excursion steamers in New York District in 1903 was ascertained to be two million, three hundred thousand. It was my opinion that any condition of the water which was capable of injuring the business of transporting commuting passengers was certain to do at least equal injury to the excursion business. A large proportion of the people who patronize the excursion steamers do so in order to reach in a pleasant and expeditious maner what are called day summer resorts. These are merely extensive bathing beaches in most cases, with hotels, restaurants and a great variety of amusements places. The largest resort of the time in the vicinity of New York is Coney Island where the daily attendance is estimated ofter to reach from two hundred thousand to four hundred thousand persons. Other extensive bathing beach resorts were Midland Beach and South Beach
on the Staten Island Shore. These are all below the Nar-
744 rows and shores of the lower Bay. Millions of dollars have been invested in the resorts to attract visitors and they are very popular. They would all suffer material loss in patronage if the water became sufficiently polluted to affect health. In connection with the excursion beaches and the importance which attaches to the condition of the water where people bathe at those beaches, I took into account the amount of bathing which was done in the waters of New York Harbor above the Narrows. It was estimated by the Commissioner of Public Works of Manhattan and the Commissioner for Brooklyn, the officials who have charge of

the public bathing establishments of New York City, that over three million baths were taken in the floating bath houses maintained around New York City water fronts in a year.

Q. What year was that estimate made, Doctor?

A. That was for the year 1903.

Q. After making these various investigations that you have just described in your testimony, Doctor, did you extend your studies to the Passaic Valley Sewer project, and if so, will you please state how you conducted your investigations to that project?

A. I inquired into the project of the Passaic Valley Sewer Commission, both in connection and conjointly with my fellow members of the Pollution Commission, and independently as a member of the Pollution Commission, in order to report my personal opinion to the other members of the Board. That work, so far as it relates to the joint study of the question, included two conferences held with the Passaic Valley Sewerage Commissioners, one in New York and one in Newark, and conferences among the members of the Pollution Commission, at meetings when the Passaic Valley Commissioners were not present. Reports of the Passaic Valley
745 Commissioners and of various engineers who were called in for the purpose of consulting with the Passaic Valley Commissioners, and reported opinions concerning the pollution of the harbor, which might occur in case the Passaic Valley Commissioners' project was carried out, were taken into consideration. I made a visit to Boston to examine the conditions surrounding the out-falls of the main drainage works of Boston and vicinity, and studied reports on the conditions surrounding those out-falls made by investigators who were employed by the Massachusetts State Department of Health to determine the conditions.

Q. Did you find in your examination any fundamental errors in the reasoning of the Passaic Valley Engineers concerning the probable effects of discharging sewage into New York Bay?

A. I considered that I found a serious error in the assumption that the sewage from the Passaic Valley Sewer became diffused and transported to sea without producing objectionable consequences.

Q. Did you in the course of investigations that you are now testifying to, did you seek any practical examples in large sewer outfalls to help you to form an accurate opinion concerning the conditions which would occur if the Passaic Valley Sewer was put in operation?

A. Yes, and the only example which seemed to indicate the conditions which might be expected on the Passaic Valley discharge were believed to exist in Boston Harbor. Precedents for the discharge of volumes of sewage comparable with those which ultimately would be discharged from the Passaic Valley Sewer were difficult to discover, but in Boston Harbor there was an example of an attempt to dispose of sewage in large quantities in much the same way as that apparently proposed by the Passaic Valley Com-

mission. It seemed unwise to consider that the discharge of
746 sewage into lakes or inland rivers bore a close and reliable resemblance to the discharge of sewage into New York Harbor, for our studies of the diffusion of salt and fresh water in the Bay led to the opinion that an intermittent thorough mixing of the Passaic Valley Sewage with the water could not be expected to occur promptly, and that the backward and forward oscillations of the tide would carry sewage sometimes to the very opposite direction from the ocean. It seemed that we should have to reject the idea that the sewage would be promptly carried to sea and consider only whether it could be assimilated or digested by the water of the — and rivers in the vicinity of New York. In that connection my opinion was that the digestive capacity of the Harbor was very great, larger than would probably be necessary for the assimilation of the sewage which would probably need to be discharged into it for many years to come. But this conclusion was not based on the assumption that sewage would be brought to the Bay from communities remote from the shores of the Bay, nor upon exceptional conditions, such as the discharge of a very large quantity of sewage at any particular point. I considered that such conditions, if not prevented, might easily lead to local nuisances, and after charging the water with organic matter which could only putrefy and lead to objectionable conditions. The location of the proposed out-let seemed to me to be very objectionable as being close to a densly populated city. I believe that if the conditions in Boston Harbor would be taken as an indication of what might happen in New York Bay, the discharge of the Passaic Valley Sewage might ultimately lead to the discoloration of about three thousand acres or 4.7 square miles of the surface of the water at certain times. This local discoloration with the possibility of the creation of of-
747 fensive odors directly in the path of ferry boats, excursion steamers and the Atlantic Shipping, would in my judgment be a cause of serious annoyance. The point selected was close to the—was on the edge in fact of the main shipping channel where the ferry boats and excursion steamers and the Atlantic shipping chiefly passed.

As to the effect on health, I found that the proposed outfall was within half a mile of the pierhead line, and a mile and a quarter of the line of solid filling established by the United States Government on the New Jersey shore within two miles of Staten Island and of Liberty Island, a popular point for tourists and other visitors to New York. And of Governors Island, the headquarters of the United States Army in the Eastern District. The Brooklyn shore was about two miles away. Ellis Island, the headquarters of the United States Immigration Bureau was within two and one half miles. The southern end of Manhattan was about three and one quarter miles away. Immediately to the west were the Jersey flats, comprising about 8 square miles of the upper Bay, underlaid by a muddy bottom, beneath the water ranging from one to seven feet in depth at low tide.

Q. Now, Doctor, taking the whole work done by the New York Bay Pollution Commission between June 2nd, 1903 and March 31st, 1905 and the result of various investigations conducted between those dates, what conclusions were reached by that Commission?

Mr. Riker: Have they not been put in evidence? I thought they had. I thought you had already gotten the Professor to testify to that.

The Witness: By the commission or by me personally?

Q. By you personally?

A. The studies which I have made for the pollution com-
748 mission up to March 31st, 1905, lead me to the following opinions:

Mr. Riker: What page are you reading from?

The Witness: I have not read from any page very much. I am following through the report of the Pollution Commission of March 31, 1905.

Mr. Riker: At — page are you?

The Witness: At page 84. If you wish, I will read from now on.

Mr. Riker: I have no wish at all. I just wanted to see what is before you when you are testifying.

The Witness: My conclusions I had better give categorically, and in the language in which I framed them at the time when my report was made.

Q. You can supplement that language from your memory, Doctor, any thing that you have omitted, or anything that will throw further light on it, as you go along?

A. Do you wish me to call the numbers or not?

Q. Put it any way you please?

A. The effects of the present pollution of New York Harbor, although not great are never the less measurable. By that I mean to say that there was an appreciable amount of effect, in enough which could be definitely determined by means generally employed in the sanitary analyses of water. A careful study of the proportions of sea water and fresh water in the Bay and rivers about New York shows that sewage of New York City is not promptly flushed out to sea, excepting during freshets in the Hudson. The water of the incoming tide is not ordinarily much purer than the water of the outgoing tide in the upper Bay. It is probable that most of the sewage that enters the Bay is disposed of in the Bay by animals and plants, chiefly the bacteric which live in this water. Direct chemical action between the dissolved oxygen and perhaps
749 other elements naturally present in the water may play an important part in this final assimilation of the sewage. The most usual effect of the tide is its production of currents whereby the sewage becomes mixed and diffused. The drainage which now enters the Bay does so in the most favorable manner possible for diffusion. That is in so far as it is discharged at a large number of outlets situated along an extensive shore line. How much sewage and other organic matter can be emptied into the Bay without killing those forms of life which now destroy the sewage and so so creating a general nuisance it is impossible to say. This is a matter

of great importance, but its study requires analyses and experiment which have been beyond the reach of this commission. The Commission believed and elsewhere has stated that it felt it had only made a beginning in the study of the complex problems of sewage disposal in New York Harbor. Compared with the fresh water streams, or the ocean, New York Bay is not a favorable place for the inoffensive disposal of sewage. Should the Bay become overloaded with sewage, the odors which will arise from it will be particularly offensive. The amount of solid matter which now enters the Bay with the house and street sewage every twenty-four hours, is approximately equivalent to 1,047 tons of sludge in dry condition. That is, it is sludge when dried that would weigh the 1,047 tons. About one half of this is organic matter. The Bay is not likely to be polluted to such an extent that a general nuisance will occur for 25 years at least, if it — used solely for the discharge of sewage from the communities which are adjacent to its shores. Long before a general nuisance is produced, local nuisances will occur, as
750 may be seen at present to a limited extent, where sewers and drainage from industrial work empty into still or comparative — water in New York Bay and Harbor. Observations made by the United States Government show that a distinct current of salt water sometimes runs up the Hudson under water without respect to surface currents and it has been suggested that this under-run carries sewage from New York City up the river and empties it in to pot holes or depressions in the bed of the channel, where it remains until washed out by the freshets. That suggestion was made by Henry Mitchell, and was bases partly upon some tests for sulphides, which he reported to have made. The oyster beds in New York Bay are almost exclusively located in the southea-terly side of Staten Island and Gravesend Bay. Most of the oyster and clam beds are now free from dangerous pollution, although there are some on the Staten Island shore near the Narrows, and Kill von Kull, and a few in Gravesend Bay, which are nearer sewer out-falls than is proper. Our analyses of oysters and clams show that shell fish which are grown and immersed some hours in polluted — become polluted themselves. The increasing amount of pollution to which the waters of New York Bay are subjected, makes it seem only a question *on* time when oyster culture will be driven from this locality, but with wise and careful protection a large part of the present oyster grounds can be kept safe for some years to come. The almost universal custom in this vicinity of drinking, that is bleaching or bloating oysters in polluted streams of fresh water places all shell fish under the suspicion of being contaminated. The pollution of the Bay has no visible effect upon the number of fish caught in the vicinity of New York, although petroleum and other industrial wastes appear to have occasionally affected the flavor and con-
751 sequently the value of small catches of shad. The transportation of passengers on ferry boats is one of the most important industries connected with the Bay. The number of passengers transported in the New York District in the year 1903, having been two hundred and four million, and the number which traveled directly

across the center of the Upper Bay, eight million 8 hundred and eleven thousand. This business would be seriously injured if the water became offensive to the sight and smell. Unrestricted pollution of the Bay would destroy the healthfulness and attractiveness of the parks and recreation piers which have been built by the City of New York on the water front for the benefit of the poor. Excursion steamers carried about two million three hundred thousand passengers to bathing beaches and other summer resorts in or near the Bay in 1903. The most important of these places are located a little beyond the Narrows, the Lower Bay, and represent a total investment of several millions of dollars. The pollution of the Bay will eventually injure the healthfulness and business value of these resorts unless the pol-ution is restricted. The project of the Passaic Valley Sewerage Commissioners of New Jersey, if carried out would ultimately empty into the center of the Upper Bay, about three hundred and forth five million, eight hundred and fifty thousand gallons of sewage per day from community not adjacent to the Bay. The proposed sewer, if put into service at once would increase the amount of house sewage and storm drainage which enters the Bay by about 50 per cent. The Natural increase in population of New York and vicinity will by 1930 increase the present amount of
752 pollution about 65 per cent. If the New Jersey Sewer is built, the pollution of New York Bay will be more than doubled in the next twenty-five years. Second, since the organic matters contained in the sewage which is emptied into the Bay, must be destroyed by assimilation in the Bay, it is evident that the discharge of so much sewage as that proposed by the Passaic Valley District Sewerage Commissioners must first be diffused before it can be purified. It is by no means clear that the sewage would be so diffused before reaching inhabited shores. Precedents for the discharge of so much sewage at a point as contemplated by the Passaic Valley Sewerage Commissioners indicate that this quantity of sewage cannot be emptied into New York Bay in accordance with announced plans of the commission without producing a local nuisance. Probably the nearest approach to the conditions which might be expected is in Boston Harbor. At Deer Island, in Boston Harbor the discharge of 38,300,000 gallons of sewage per day causes the water about the outlet of the sewer to be discolored over an area of 350 acres. At Moon Island also in Boston Harbor, the discharge of 22,000,000 gallons of sewage in about three quarters of an hour discolors about 750 acres, about two thirds of this area being offensive to the sight and smell. The areas discolored vary somewhat but the figures given are believed to represent averages. If the conditions in Boston Harbor are a fair example of what would happen in New York Bay, the sewage from the outfall of the Passaic Valley Sewer would ultimately discolor and render more or less offensive above 3,000 acres or 4.7 square miles of the most beautiful and most traveled part of New York Bay. On calm days the sleet or thin film of grease
753 from this sewer might reach Liberty Island, Ellis Island, Governors Island, and the Battery, or Brooklyn and Staten Island.

In addition to these personal opinions and conclusions I took part in framing the general report of the Pollution Commission, and signed it, believing that the opinions there expressed were sound and in accordance with my personal views.

Q. Based upon the work done by the various members of the commission and yourself up to that time?

A. Up to that time.

Q. Did the New York Bay Pollution Commission make any other report than the one dated March 31st, 1905, and referred to in the testimony which you have already given?

A. Yes, the New York Bay Pollution Commission made a report dated April 30th, 1906 to the Governor of the State of New York. That report was transmitted to the Legislature May 3rd, 1906, and was printed, together with an appendix. The two documents appeared as Assembly Document No. 76, 1906. This was the second and final report of the New York Bay Pollution Commission.

Q. Will you explain, Doctor, how this second report came to be made?

A. The Pollution Commission expected to expire by limitation with the completion of the report which the commission was created to make, and which has been referred to as the first report of the Pollution Commission, and bears the date March 31st, 1905, but at the suggestion of the Governor, the Legislature continued the life of the commission for another year and made a small appropriation for its expenses. The commission in its first report has recom-

754 mended that the whole subject of the pollution of New York Harbor and the necessity for devising means for protecting the Harbor against excessive pollution in the future, should be made the subject of thorough study, and by a board of large enough scope and of sufficient appropriation to solve the problem authoritively and finally. The report of the Pollution Commission dated March 31st, 1905 came too late for the Legislature to take favorable action upon it in case it chose to do so, and I believe the pollution commission was continued for another year in order that the subject matter contained in its first report should come before the public and be acted upon if the public saw fit to take any action concerning it, and in order that the Pollution Commission might make some further studies in the line of the work which it had already begun.

Q. What was the date of the second report, Doctor?

A. The second report was dated April 30th, 1906.

Q. That would be practically thirteen months after the first report was dated?

A. Yes.

Mr. Riker: Is not that a matter of calculation? That is a mathematical computation that I think I can make just as well, or the Doctor can, as well as the witness. I object to the question.

Mr. O'Sullivan: I do not press the question.

Q. I hand you here a pamphlet, Doctor, and ask you to describe that pamphlet.

Mr. Riker: Would you mind letting me see it first, Doctor?

Mr. O'Sullivan: I have not offered it in evidence yet.

755 Mr. Riker: But you are examining the witness as to the paper. I do not understand that you can put in any evidence in connection with an exhibit without showing it to counsel. I object to the witness answering that question unless the document is submitted to counsel.

The Commissioner: Note the objection.

Mr. O'Sullivan: Counse- for the Complainants herewith submits the pamphlet in question.

(Pamphlet in question handed to Mr. Riker by Dr. O'Sullivan.)

Mr. Riker: I object to the description of the pamphlet, because it has not yet been made competent, nor any part of its contents, are admissible evidence in this court.

The Commissioner: Note the objection.

Mr. O'Sullivan: I direct the attention of counsel for defendants to the fact that it has not been offered in evidence. I withdraw my first question.

Q. The pamphlet which I have handed you, Doctor, what title does it bear?

Mr. Riker: I object to the introduction of any evidence as to the contents of this pamphlet, in as much as it has not yet been made competent, or any part of it has not been made competent in this court.

The Commissioner: Note the objection.

Q. I hand you, Doctor, a pamphlet purporting to be a report of the New York Bay Pollution Commission to the Honorable Frank Wayland Higgins, Governor, Dated April 30th, 1906, and ask if that is the second report which you have just described in your testimony, or a copy of the second report?

756 A. After examining it as well as I can at this time and comparing it with a copy of the last printed report of the New York Bay Pollution Commission, I answer that it is a copy of the printed report of the New York Bay Pollution Commission, dated April 30th, 1906.

Dr. O'Sullivan: I offer it in evidence.

Mr. Riker: I object to the offer on the ground that it has not been proved. It has been stated by counsel and the witness to be a copy of an original. The original has not been proved or made competent. I object on the further ground of the failure to procure the original, and failure to produce the original had not been explained.

The Commissioner: Note the objection.

The Pamphlet is marked Complainants' Exhibit No. 3.

Q. Doctor, was any analytical work done by or for the New York Bay Pollution Commission subsequent to March 31st, 1905, when it submitted its first report?

A. Yes. There was more work done and reported upon in an appendix, the only appendix which accompanies the final report of the Pollution Commission.

Mr. O'Sullivan: I would like to state to counsel for the defendants that I will furnish him at recess with a copy of this report. I have not got a spare copy now, or I should do so. You can use the exhibit itself until you get the copy.

The Witness: The Commission felt that with the small sum of money at its command, it was able to do only in a small way some of the things which the commission had in its original report recommended, but it made nevertheless some examinations
757 which it felt to be essential, namely, bacteriological, chemical and sanitary examinations of the waters and shores of the Harbor. The commission as a whole felt that the result of this second class of evidence demonstrated still more clearly the need of full and early consideration of the large question of sewage pollution of this Harbor.

Q. And was it with that object in view that the supplementary investigations were instituted?

A. Yes. There were some immediate objects to be accomplished. It may be remembered that the investigations which had been made by the Pollution Commission up to this time so far as they depended upon analyses of the water, related chiefly to upper and lower New York Bays. It was now desired to determine whether the waters of New York Bay were comparatively uniform in quality at all depths, or whether a perfect mixture of the salt water, fresh water and sewage did not occur. Whether the waters of East River, the Harlem River and the Hudson bore positive evidence of sewage, if so, how much, and whether the supply of oxygen was always sufficient for the oxidation of all organic matter by and through the bacteria in the water. The analyses were confined to the chemical and bacteriological determinations uniform in character with those reported by the commission in the first place, the methods of analyses and the ways of reporting of the same.

Q. How many analyses were made for the second report?

A. 115 chemical analyses. The same number of bacteriological examinations. As a rule the chemical and bacteriological examinations were made from the same sample of water. The commissions' first mass of analytical data embodied the results of about 40 examinations of water and about 51 of shell fish.

758 Q. During what part of the year where these tests made, Doctor?

A. They were made during the winter, and perhaps a word should be said with respect to the application of the results through out the year.

Q. One moment, Doctor. Did the season of the year during which these tests were made have any effect of the result?

—. It probably did. It is believed that the numbers of bacteria would have been larger had the observations been made in the summer season. It was believed so at the time. It is also to be taken into consideration that because of the amount of rain fall which occur-ed at about the season when these samples were taken, that the results may have been better than would have been obtained in the dry mid-summer period.

Q. You state that those analyses were made during the winter months. What effect has cold on the growth and multiplication of bacteria?

A. Why, it probably restricts the growth and multiplication.

Q. Now, Doctor——

A. Excuse me a moment. I would like to proceed with that. There was a sanitary inspection made in a systematic way of the shores of the Harbor. That was part of the work done in 1906, which I may not have referred to already.

Q. What were the general results of the work done for this second report?

A. Well, the general results were to confirm in large measure the opinions drawn from the first mass of data collected by the pollution commission concerning the quality of the water.

Q. Doctor, will you relate the detailed results of the examinations or indicate on the map or chart which accompanies this exhibit, where the same were taken for analyses. You will find a map there, Mr. Riker.

759 Mr. Riker: Yes, I see it, thank you.

The Witness: The map which accompanies the report of April 30th, 1906, shows where the waters and shell fish analyzed by the pollution commission throughout its existance were taken.

Mr. Riker: Do I understand the witness to mean by that that he was present when they were taken? All right, if he does not want to answer now I can ask him *of* cross examination.

The Witness: I am asking if I am to answer that question?

Mr. O'Sullivan: Had you not better wait until the cross examination?

Mr. Riker: Well, put it that way.

The Witness: The location of the samples taken and reported upon in 1906 is indicated by numerals in red enclosed in rectangles colored red. Otherwise the map is practically the same as that contained in the first report of the New York Bay Pollution Commission. One lot of samples was collected in the upper New York Bay to determine whether there was appreciable difference in the bacterial conditions of the water at the surface and at different points toward the bottom. The date of the collection of these samples was January 28th, 1906. There was a second series taken on January 30th in the same territory. The map numbers of the analyses made from samples collected in these two series *frun* from 51 to 83 inclusive. It was found that the numbers of bacteria were much larger near the surface than in the water below. The reduction in numbers with depth appeared striking, and were taken to indicate than most of the sewage and other decomposible refuse with which the becteria were associated, flowing around, at the surface, or not mixing uniformly with the water. Tests were made
760 for B. Coli were taken to confirm the conclusions which might be derived from the study of the numbers of the bac-

teria alone. There were more Coli at the top of the water than in the water below. In a very large majority of all the samples examined in the Commission's investigations, the tests of B. Coli resulted positively. The detailed information produced by the analyses of the bacteria were samples collected January 28th and January 30th at various points and at various depths in the Upper New York Bay, and they are with collateral information gathered in order to throw light on the result and aid in a fair interpretation—we found on page 14, pages 13 and 14 of the printed report of the Pollution Commission.

Q. Of April 30th?

A. Of April 30th 1906. For convenience of reference I may say that this report with its appendix and accompanying map may be found as number 76, Assembly Document No. 76, dated May 3rd, 1906, the report having been submitted to the Legislature by the Governor on May 3rd, 1906 and is identified as Complainants' Exhibit No. 3.

Mr. O'Sullivan: In future Doctor, will you refer to it as Complainants' Exhibit No. 3 for brevity.

Adjourned for Recess to 2 p. m.

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CITY HALL, NEW YORK,
November 22nd, 1911—2 p. m.

GEORGE A. SOPER recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan (Continued):

Q. Doctor, can you submit detailed data of the examinations made at various points in Upper New York Bay, considering first the numbers of bacteria and the tests for baccilli and B. Coli?

Mr. Riker: I desire to interpose an objection at this stage, because it does not yet appear that the witness has made any of the examinations, or has been present when they were made, nor as a matter of fact what the data are upon which his opinion is asked.

The Commissioner: Note the objection.

A. Yes, I can. I have referred already to data of the character to which you refer. On page 14 of Complainants' Exhibit No. 3 will be found two tables of detailed——

Mr. Riker: Excuse me a moment before the witness goes on testifying, I would like to examine him on this table, the tabulation, and on what it is founded.

Mr. O'Sullivan: All right, sir.

Cross-examination by Mr. Riker:

Q. Doctor, did you collect any of the samples which are supposed to be the basis of this table?

A. I did not.
Q. Were you present when they were collected?
A. I was not.

Q. Did you make any bacteriological examination of any
762 of those supposed samples?

A. I did not.
Q. Were you present when they were made?
A. I was not.

Mr. Riker: I object to his testifying to matters which are not proved, which are not within his own knowledge.
The Commissioner: Note the objection.

Q. Will you state, Doctor, how you acquired the facts and data that you enumerated and which you have indicated now are to be found on page 14 of Complainants' Exhibit 3?

A. Acting by appointment as a special committee of the New York Bay Pollution Commission, created to report on the sanitary condition of the New York Bay as shown by chemical and bacteriological analyses of the water, and inspections of the shores, I engaged Mr. D. D. Jackson of the Mount Prospect Laboratory of Brooklyn, to make examinations to which I refer in this testimony. I told Mr. Jackson where to collect the samples and at the approximate time, and to make the analyses in accordance with the standard methods of analysis employed at the Mount Prospect Laboratory, and to design to give certain specific information. The certain specific information in the case of the two tables to which I now refer included besides a description of the point of collection of the information, a time of collection, the depth below the surface of the water from which the samples were taken, the number of bacteria*l* per cubic centimeter, and the result of tests for bacilli B. Coli in samples of one tenth, one and ten B. C. centimeters of the water, and Mr. Jackson reported to me, reported the data on blank form which he had filled out in accordance with the instructions he had received *a*t to the data which he had collected. I took the reports which Mr. Jackson handed me. We discussed them to some extent. I tabulated them in forms of the two tables. On page 14 of Complainants' Exhibit No. 3 are markings mak-
763 ing the location of the samples with Mr. Jackson's aid, on a map of New York Harbor and vicinity, issued by the New York Bay Pollution Commission in 1905. The red included in rectangles on the map indicate the work which I did on the map in connection with the work of the New York Bay Pollution Commission, as described in Complainants' Exhibit No. 3. The Map is a map, which was published in the New York Bay Pollution Commission's Report, March 31st, 1906 known as Complainants' Exhibit No. 2. It being remembered that the red markings upon that map were made to show *were* the work, where the samples had been collected subsequent to those originally reported upon and indicated on the map, when the map was first printed. I also collected other information personally, which accompanied the two tables to which I am referring on page 14 of Complainants'

Exhibit No. 3. I ascertained the stage of tide which had occurred at the time the samples were taken, and the wind, and the tide being taken from the Government tide table, issued in printed form and wind being taken from the United States Weather Bureau Record. When the data were cast in the former tables I inperpreted them as incorporated the results of my study of the data in my report to the New York Bay Pollution Commission, known as appendix to the Exhibit and part of the Exhibit No. 3.

Mr. Riker: Now, I renew my objection to the use of the so called Exhibit No. 3 by Complainants, on the ground that it appears that it is an expression of opinion, or opinion evidence upon data which has not been proved in the case, and which has not been presented even in the form of a hypothesis.

The Commissioner: Note the Objection.

Q. My question now, Doctor, is, can you give the detailed data of the examinations made at various points in Upper New York Bay, considering first the numbers of bacteria and tests for B. Coli?

764 Mr. Riker: I object to that question on the ground that it calls for an answer from this witness as to matters as to which he has stated he has no personal knowledge and it is therefore entirely hearsay.

The Commissioner: Note the objection.

A. I can and do submit such detailed data. Do you wish me to state the result throughout these two tables?

Q. Yes.

A. Referred to upon page 14.

Q. Also give what inferences you drew from this data?

Mr. Riker: Will you divide the question, Doctor, if you can. I would like to interpose an objection to each one of the questions. They are different.

Mr. O'Sullivan: Confine yourself to the first question relative to the detailed data.

A. I do not clearly know whether I am desired to give each item of data contained in each table, of whether it will be sufficient for me to refer to the tables. There are from 51 to 83, over thirty samples included in these two tables.

Q. Then you had better give the general results in your own language?

A. The tables show that the numbers of bacteria were very much larger near the surface than in the water below. The reduction in the numbers with the depth is decided, and indicates most of the sewage and other decomposible refuse which the bacteria is associated with, as flowing around, near the surface, and not mixing uniformly with the water. The tests for B. Coli were considered to confirm the conclusion, which might be derived from the study of the numbers of the bacteria alone.

Mr. Riker: I move to strike out this last testimony one
765 the ground that it is opinion and expert on data not proven in the case.

The Commissioner: Note the objection.

The Witness: There were mpre Coli at the top of the water than in the depths below in the water below. In a large majority of cases, the Colon bacillus is found in the samples.

Q. State what inferences, if any, you drew from this data?

Mr. Riker: The same objection.

The Commissioner: Note the objection.

A. Do you wish me to state any inference again? I have just stated them.

Q. Are there any in addition to those you have stated?

A. If I am not mistaken this matter was gone over this morning, was it not?

Q. I do not think so, Doctor. Have you now stated fully the inferences that you drew from the data that you referred to in these tables on page 14 of Complainants' Exhibit No. 3?

A. I have stated the essential inferences that I drew at the time, and all that I now recall having drawn in connection with those two tables.

Q. Doctor, did you collect any data or show the condition of any of the more heavily polluted tributaries of the Harbor?

A. Yes. Analyses were made of the water of the Gowanus Canal for example. The Gowanus Canal was one of the most densely polluted arms of the Harbor. The odors from the Canal constitute such a decided nuisance that the City of New York recently decided to make an improvement. In fact contracts had been let for the construction of a tunnel and pumps to connect the head of the canal directly with the Bay at Buttermilk Channel.
766 The object of the flushing tunnels and the pumps were to establish a circu-ation of water to flush out the material which otherwise remained stagnant and became malodorous, discolored and otherwise objectiona*lbe* in the canal. The tunnel and pumps were estimated to cost some hundred thousand dollars. Three samples of canal water were taken at different points between the outlet and the head of the canal. That was done on February third, 1906. The detailed data resulting from the examinations is contained in a table on page 16 of Complainants' Exhibit No. 3.

Mr. Riker: One moment, I would like to renew my questions; I presume the answers will be the same.

Cross-examination by Mr. Riker:

Q. Did you get the samples yourself?

A. I did not.

Q. Did you make the analyses yourself?

A. I did not.

Mr. Riker: I object to the use of the Exhibit.

The Commissioner: Note the objection.

A. These analyses and the others in my report to the Pollution Commission were made in the same and under the same circumstances, as to my connection with the work. I directed the work and the results were,—the bare results were returned to me and with the data so procured, and with other data collected by me, I interpreted the facts collected on the analysis.

Mr. Riker: Now, I would like to put a general objection on the record to any evidence based on this data, because it appears that the witness did not make them. They have not been proved in this cause, and they are therefore not a legal foundation for any expert or opinion evidence.

The Commissioner: Note the objection.

767 Mr. O'Sullivan: Counsel for Complainants would like to state in answer to that objection that the actual analytical work was done under the direction and at the instance of the witnes- now on the stand, by D. D. Jackson, the Superintendent the present Superintendent of the Mount Prospect Laboratory and he will succeed this witness on the stand and will supply the features, the lack of which counsel for defendants objects to.

A. Without describing the data in detail, stating the results generally, I may say that the number of bacteria were very large, as were the amounts of free and albuminoid ammonia reported. The tests for B. Coli resulted positively in every case. There were examinations made of other inner tributaries of the Harbor, Bodine Creek, Rahway River and the Bronx River, with results very like those already described for the Gowanus.

Q. Did any special interest or significance attach to the conditions of these heavily polluted tributaries according to your investigations, Doctor?

A. Yes. In my judgment the conditions found indicated, you may say, it was a warning of what the whole Bay might become if the Harbor was not protected against unlimited pollution by sewage.

Q. What was the condition of the water at different depths in the Lower Bay and the Narrows as shown by analysis?

A. The numbers of bacteria were not as large in the Lower Bay as in the Upper Bay, but the differences were comparatively slight; not so many samples of deep water as surface water gave positive results for Coli. That opinion is based on results of a bacteriological analysis taken from various points at different depths in the Lower Bay and Narrows on February 17th, 1906. The

768 detailed results are given on page 17 of Complainants' Exhibit No. 3.

Q. Did you make any inquiry into the conditions of the waters of the Upper Bay and the lower part of the East and Hudson Rivers, in the course of your investigations?

A. Yes, a series of examinations of those waters was made from samples collected March 2nd, 1906. The samples collected in that special inquiry are numbered 93 to 136 inclusive, and are indicated on the map, so far as position is concerned. I refer to the map accompanying and a part of Complainants' Exhibit No. 3. The de-

tailed data are contained in a table on page 18 of Complainants' Exhibit No. 3. I drew some inferences from this table, and notably that the large proportion of positive results obtained in tests for B. Coli was significant. Nearly every test resulted positively. The numbers of bacteria were large in some cases decidedly so. The East River contained many more bacteria than the North River or the Upper Bay or even the Staten Island shore of the Upper Bay, which was one of the most polluted special localities investigated up to that time.

Q. From your investigations, Doctor, what did you find the bacterial condition of the water surrounding Manhattan Island to be?

A. The East River was decidedly more polluted than either the Hudson or the Harlem. The number of bacteria was more than twice as high in the East River as in the other two Rivers. The subject of the condition of the water surrounding Manhattan Island was made the subject of a special study, the result- of which are contained in a table on page 21 of Complainants' Exhibit No. 3. The number of analyses included runs from 141 to 166, indicated on the map and a part of Exhibit No. 3. The number of bacteria
769 were taken to indicate that the water was decidedly polluted. The presence of the colon bacillus in nearly all of the samples confirmed that opinion.

Q. What was shown by the chemical examination of the water at the various depths in Upper New York Bay?

A. The same general fact was shown by the chemical analyses, which had been brought out by examinations for numbers of bacteria, notably that the waters were everywhere polluted by sewage, and to an extent which could be measured by analytical means. The intensity of the pollution is the matter of chief interest, not the existence merely of pollution, which could have been ascertained in other ways. There were chemical examinations made of the water taken from various points which are at different depths in Upper New York Bay on January 28th and January 30th, 1906. The results of those chemical examinations are contained in two tables, Nos. 8 and 9 on pages 22 and 23 of Complainants' Exhibit No. 3. The details included the number of the sample, the point where the sample was collected, the hour of the day, the depth below the surface of the water from which the sample was taken, the amount of free ammonia, albuminoid ammonia and chlorine stated in parts per million of water. With that information are contained various other facts which were collected in order to facilitate an understanding and logical inperpretation of the analytical data. The facts to which I refer give the stage of the tide when the sample was taken, the wind, its velocity and direction, and some circumstances connected with the collection of the samples.

Q. Have you any other results of chemical analyses of water taken from various depths in the Lower New York Bay and
770 the Narrows, Doctor, than those you have testified to?

A. I have referred only to the chemical analyses of samples taken from different depths in the Upper Bay. There was a

series of samples taken from the Lower Bay and the Narrows on February 17th 1906. The results of the examinations are contained in Table No. 10 on page 24 of Complainants' Exhibit No. 3. It was found there were large amounts of free and albuminiod ammonia near the surface, and at the bottom—that is, the middle of the tidal stream, the difference were marked. It appeared that a stratum of water containing more sewage than was found in the Upper Bay lay at the top and bottom, while the water between these two strata is in a somewhat less contaminated condition. The samples in this series were 6 in number, and run from 87 to 92 and are indicated, so far as location is concerned on the map which accompanied Complainants' Exhibit No. 3.

Q. Did any fact of peculiar interest attach to those results which you have detailed?

A. Yes, it seemed possible if subsequent inquiries confirmed the supposition that a stratum of polluted water might exist amidst a volume of clear water, it seemed possible that sewage might be carried a long distance from its point of origin with out intermingling with the surrounding water. This I regarded was a matter of considerable importance and worthy of future careful inquiry.

Q. Were any chemical analyses made of water taken from the Upper Bay, and the lower ends of the East and Hudson Rivers?

A. Samples of water were taken at various points in the vicinity of the Upper Bay and analyzed chemically with results given in Table 11, on page 25 and 26 of Complainants' Exhibit No. 3. The numbers of the samples ran from 93 to 136 inclusive. Without repeating all the details of the analyses, I may simply say that I drew the inference that some of the samples although not collected near obvious sources of pollution contained relatively large amounts of free ammonia. The water in the lower end of the East River was remarkable in this respect. There was a series of analyses made of samples collected in the waters of the river surrounding Manhattan Island. Analyses were made from samples selected on April 1st, 1906, and on page 27 Complainants' Exhibit No. 3, will be found the detailed data which came from the chemical analyses. They refer to the samples and the location is indicated on the map which accompanies and is part of Complainants' Exhibit No. 3, the numbers running from 141 to 166 inclusive. I inferred from the data that the water of the East River contained on the average more free and albuminiod ammonia, than the waters of the Hudson or the Harlem Rivers, and was therefore to be regarded as decidedly more polluted. There was little difference between the water at the surface and at the bottom, so far as ammonia is indicated, which led to the inference that the waters of the East River were at the time comparatively well mixed from top to bottom.

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Q. As the result of those examinations, Doctor, what did you find to be the chemical condition of the water surrounding Manhattan Island in the Spring of 1906?

A. The chemical condition was that of a polluted harbor. The intensity of the pollution varying somewhat with the locality, but

there was always evidence of large amount of sewage that the waters were receiving.

Q. Have you now stated all the deductions that you drew from these chemical analyses?

772 A. I have stated all the deductions which seemed to be essential in the interpretation of the data. There were many minor points which could be referred to, but the essential points I think I have referred to in their incomplete way.

Q. Were any tests made to determine the amount of dissolved oxygen in the waters of New York Harbor?

A. There were, and by chemical examinations, I understood you to mean in your last question, analyses independent of the oxygen examinations, which form a separate department of study and of thought, in connection with this subject up to the present time, up to the time when the report was made.

Q. Yes, sir, I wish to be so understood as separating any of the determinations for oxygen as entirely distinct from those made to determine the ammonias or other chemical constituents of the water?

A. There were determinations of the amount of dissolved or free oxygen in the waters, samples being taken at different depths in Upper New York Bay and in the Lower Bay and Narrows. The results of three sets of determinations, made from samples collected January 28th, taken from different depths in Upper New York Bay, another from samples collected January 30th from various points and at different depths in Upper New York Bay, and another from samples gathered on February 17th, 1906 from various points and different depths in the Lower Bay and Narrows. These results are reported together with collateral information in tables, 13, 14 and 15 in Complainants' Exhibit No. 3.

Q. Appearing on what pages?

A. 28 and 29 of the exhibit. These tables of dissolved oxygen results give the number of the samples, the point of collection, the time of collection, the depth from which the sample was

773 taken below the surface of the water, and the number of cubic centimeters of dissolved oxygen per liter of water.

Q. Doctor, will you state the significance of dissolved oxygen in water?

A. The presence of dissolved oxygen in the water is essential to the inodorous disappearance of sewage which is discharged into the water. The sewage contains nitrogenous and organic matters, which, in the economy of nature, must ultimately be oxidized, and when sewage is discharged into water, there is a demand made upon the oxygen, which the water contains. If there is sufficient oxygen present to satisfy the requirements of the sewage, why ultimate mineralization of the organic and nitrogenous matters contained in the sewage may proceed to its end without the production of offensive odors, or the marked discoloration of the water. Where, however, the supply of oxygen is exhausted a process of decomposition takes place, known as putrefaction, and one of the invariable accompaniments of putrefaction is the liberation of offensive smelling gases,

or commonly the putrefaction of sewage in water results in a discoloration of the mixture. Knowing the amount of dissolved oxygen which should be present in water, and ascertaining the quantity which is present, an opinion may be formed as to the burden which the sewage is putting upon the digestive capacity of the water. Briefly, and without an attempt to be comprehensive, I should describe the significance of dissolved oxygen in these terms.

Q. Will you state, Doctor, where and under what circumstances analyses for dissolved oxygen were made? —. As I have said samples were collected and analyzed for dissolved oxygen from
774 various points and different depths in Upper New York Bay, the lower Bay and Narrows, and in the East and Hudson Rivers, and I think in the Gowanus Canal. The results of these analyses are contained in tables 13 to 17 inclusive contained on pages 28 to 31 inclusive, of Complainants' Exhibit No. 3. The oxygen was exhausted in only one of the samples examined. That is, in the one which was taken from Gowanus Canal. There was a decided reduction below the average in the amount of oxygen in the water of the Bay. Upper New York Bay, opposite the outlet of Gowanus Canal, and also near the out-fall of a large trunk sewer at 65th Street, Brooklyn. The samples collected in the Hudson River and the East River indicated little or no deficiency in respect to the oxygen. The oxygen samples were collected in some cases at different depths from the same point, that is the same geographical part of the Harbor, and in other cases at only near the surface of the water. There seemed to be no deficiency of oxygen at great depths.

Q. What were the results of the analyses for dissolved oxygen, Doctor?

A. The results are contained in the tables 13 to 17 inclusive of Complainants' Exhibit No. 3, and the inferences which I drew from the study of the results I have just given in my last answer.

Q. What other studies were made of the sanitary condition of the Harbor, Doctor?

A. Sanitary inspections were made of the shores of the Upper and Lower New York Bay. The objects of these inspections were to show, to observe a record of such sewage or other pollution as might exist along the shore in the water or on the land, and for this purpose an inspector was chosen who had had some training in sanitary directions, being a graduate in medicine and a man
775 skilled in bacteriological technique. I mention his training to indicate that he was a careful man and capable of making observations with accuracy. He was instructed by me to follow the shore and note the appearance of the water, and the shore itself with respect to sewage matter, and try if practical to get a quantitative measure of polluting matters which he saw. In order to eliminate the personal equation so far as possible, I had him in these cases where it was possible to do so, measure off a portion of the beach which contained driftwood or other debris brought up by the tide and rake together the accumulations and measure their volume. Not infrequently he was enabled in that way to give definiteness

to the results of his inspections. His reports were handed to me. I tabulated them and drew inferences with them, giving some attention to collateral information such as the direction of the wind and stage of the tide.

Mr. Riker: One question, Doctor. Were you present during any of these observations that this man made?

The Witness: No, I was not.

Mr. Riker: I object to the use of them on the ground that they have not been proved.

The Commissioner: Note the objection.

The Witness: The Staten Island shore- of the New York Bay where examined with results which have been tabulated and are contained in pages 33 and 34 of Complainants' Exhibit No. 3. The table includes the date and hour when the observations were made, the place the direction of the wind, the stage of the tide, and the conditions observed. Without attempt to give full detailed description here of the matters found, I might call attention to the observations on

March 28h at 11:20 A. M. made south of Doyle's Wharf,
776 about 200 yards north of Pennsylvania Avenue the wind,
north, the tide, ebb. There was not much drift wood or garbage. A considerable amount of grease floating in the water. Water polluted with considerable amount of sewage. Nearest sewer foot of West Street 100 yards away. Did not appear from tide the wind to come from this. Again at the ferry docks at St. George on March 30th, 1906 at 9:20 A. M. East wind, flood tide. Scum of Grease and kerosome, fibrous material, garbage, wood and so forth floating about the docks no odor, no sewage noted. I mention these as samples the table shows that the Staten Island shore accumulates considerable quantities of refuse which is carried to the shore in all probability by the tide. The results of inspections of the New Jersey shore of Upper New York Bay are contained in table 19 of pages 35 and 36 of Complainants' Exhibit No. 3. An example taken from that table may be cited as follows: April 3rd, 9:40 A. M. Foot of East 49th Street Bayonne. Northwest wind; flood tide. Large brick sewer here ending at high water mark. Sewer flows over beach, tide being low. Some refuse of- shore. In four hundred square feet of shore, one thirtieth of a cubic yard of vegetable and one sixtieth of a cubic yard of animal matter, odor 100 feet leeward. By 400 feet is meant within a rectangle twenty feet on the sides. With respect to the information contained in that whole table, I inferred that the New Jersey shore of Upper New York Bay was on the whole comparatively free from physical traces of sewerage, except in the neighborhood of outfalls of local sewers. Sanitary inspections of the Brooklyn shore of Upper New York Bay were reported in table 20 contained on pages 36, 37, 38 and 39 of Complainants' Exhibit No. 3. Sewage was occasionally reported and

garbage and other refuse on the shore and in the water. The
777 scum of sewage origin is frequently mentioned as being on
the surface of the water visible from the shores. Considering the table as a whole, the Eastern or Brooklyn shore of Upper New

York Bay appeared for nearly its whole length to be polluted with sewage, refuse and garbage. The amount of the pollution diminishes in the direction of the Narrows. An inspection was made of the shores of the Islands of the Upper Bay. The results are contained in table 21 on pages 38 and 39 of Complainants' Exhibit No. 3.

Q. Do you mean 39 and 40, Doctor?

A. 39 and 40. Considering the table as a whole, I inferred that the shores of the Island of the Upper Bay were for the most part comparatively clean, except for sewage which was evidently discharged from buildings on the islands themselves. There were points, however, on Governors Island and Liberty Island where the remains of sewage were found which could not have originated near by. This was long range pollution of the most objectionable character. Sanitary inspections were made of the shores of New York Bay from the Narrows to Coney Island and Sheepshead Bay. These inspections are contained in table 22 of Complainants' Exhibit No. 3, pages 41, 42, and 43. I consider that some of the information brought out on the inspections referred to in table 22 are among the most important and significant data that had been procured by the Pollution Commission up to that time. I invite particular attention to the reports of the condition of Coney Island Point, or Norton's Point, as it is sometimes called. Considering first the item under April 13, 11:25 in the morning. The shore of Gravesend Bay around the East side of Norton's Point. South wind, ebb tide. A great
778 quantity of drift wood and some garbage on shore. Scum of sewage on surface of water. Grease balls three by three inches. No sewers nearby. Driftwood and sewage backs in from New York Bay with the tide. Men gathering wood on the shore said a new supply came in every day. In four hundred square feet of shore, 3 cubic yards of vegetable matter mostly wood, and one twentieth of a cubic yard of animal matter was found.

I might interject that a grease ball is a mass of grease of various kinds almost invariably with a center or nucleus composed of a clump of hair or a match or other solid matter. Grease balls are found in large, long sewers, being particularly likely to give rise to them. There are no such grease balls as are referred to in these inspections —they are not known to be formed in any other way.

Again, a little further along the same shore at 11:50 scum of sewage on surface. Two grease balls 2 by 2 and 3 by 3 inches. No odor of sewage. Some garbage and drift wood on water. Still furthe- toward the sea on the west side of Norton's Point, immense quantity of drift wood. In 400 square feet of shore, five cubic yards. Some garbage, straws and bottles. No sewage on the water. Grease balls on shore 2 by 2 inches.

On comparing table 22 with table 18 it will be seen that both shores of the Lower Bay were polluted for a considerable distance from the Narrows.

The Staten Island shore contained large quantities of garbage, as far as the inspections were continued in that direction, that is to Midland Beach. The North shore of the Lower Bay was fairly free from visible evidence of sewage and other pollution except near the

outlets of local sewers, where occasionally small amounts of sewage scum were seen floating at a considerable distance from the shore.

779 The presence in this vicinity of large grease balls, which could only have been derived from sewers of considerable length, shows that some sewage was evidently transported to the shore from Brooklyn sewers which empties into the Upper Bay. That portion of the shore of the outer Harbor which lies in the vicinity of Norton's Point, contains so much drift-wood, harbage and sewage matter, that it seemed reasonable to conclude that this was refuse which had run out of the Upper Bay through the Narrows.

As much as five cubic yards of animal and vegetable refuse was found in four hundred square feet of beach in this vicinity. Men who were found gathering the wood here said that the supply was inexhaustible. From Norton's Point eastward there was a constant change until about midway between the two ends of Coney Island it was reduced to an occasional amount of garbage. The shores of Sheepshead Bay were fairly clean, as might be expected at this season of the year. The inspections confirmed what the chemical and bacteriological analyses of the Commissions had already indicated concerning the objectionable practice of cultivating the oysters in creeks in the immediate vicinity of New York. The conclusions which I drew from——

Q. Will you state first, Doctor, what the objects of the inspections were?

A. The object of the inspection was primarily to observe such sewage or other pollution as might exist near the shores. It was thought that some knowledge might be obtained that way to indicate whether sewage materials were likely to flow from distant sources to the shores and in order to get knowledge of the condition of the waters near the shores and of the shores themselves, such as

780 could be seen by the unaided eye, and with out the annoyance or knowledge of chemical or bacteriological tests. Doctor Parsons who made the examinations had not been connected with the analytical work nor with any other work of the pollution commission.

Q. Did Doctor Parsons make these inspections?

A. As I have already said Doctor Payne B. Parsons was the inspector who made the inspections.

Q. And what instructions were given Doctor Parsons when he undertook to make these inspections, Doctor?

A. As I have already testified I instructed Doctor Parsons to walk along the shore and note the conditions that he observed.

Q. And the results of these inspections are set forth in the various tables that you testified to?

A. They are.

Q. Now what inferences did you draw, Doctor from the reports of the inspector, Doctor Parsons?

A. Well, I have already given my inferences, by- I will repeat them again if that is desired. The shores of the harbor——

Q. Perhaps I did not make myself clear, Doctor. What conclu-

sions did you draw from the labors of this inspector and from the conditions which he reported to you?

Mr. Riker: I renew my objection to his conclusions based on alleged data which has not been proved in the cause.

The Commissioner: Note the objection.

A. The opinions I drew from all of the work which I was in charge of for the Pollution Commission, both sanitary and inspections and the analytical work were as follows: In general I may they were in conformity with the opinions recorded in the first report of the Commission, and went far to confirm the accuracy of the deductions, the inferences were expressed from the data at hand,

781 The opinions were that the waters of the Bay and adjacent waters are unmistakably, but not as yet badly, polluted. The sewage is not uniformly dispersed and diffused throughout the depth and breadth of the tidal currents. The discharge of crude sewage results in polluting the water more at the surface than in the depths below. The discharge of sewage along the shores so ofter leads to the production of a decided local nuisance. Although the present method of disposing of the sewage of Manhattan is, perhaps, as acceptable as any method of emptying crude sewage into these could be, it is far from being always satisfactory. The disposal of sewage at the pierhead line as practiced on Manhattan Island, is much to be preferred to the plan of emptying it at the bulk head line as is generally practiced elsewhere in this vicinity. There is no doubt but that offensive matter from the sewage and the sewage itself are some times transported long distances by tides and winds and deposited on shores remote from any sewer oulet. Excepting in such heavily polluted waters as Gowanus Canal, there is probably always enough oxygen in the water to enable the bacteria of decomposition to carry on their work without the production of offensive odors. No other method of disposing of the sewage of New York and vicinity is suggested as the result of these investigations. It is evident that some other methods should be devised, if practicable, but the satisfactory study of this question involves investigations of a far more exhaustive character and of a wider scope than have thus far been possible.

Q. And that was the opinion that you expressed prior to April 30th, 1906, pertaining to the investigations which you have described in your testimony?

A. That is so.

782 Q. Did you consider that final conclusions as to the pollution of the harbor were not warranted by the investigations you had made while a member of the New York Bay pollution Commission.

A. I did.

Cross-examination by Mr. Riker:

Q. The testimont which you have been giving up to the present time is directed to data assumed to have been obtained prior to April 30th, 1906, is it not?

A. I think so, yes.

Q. Is there any doubt about it in your mind?

A. Some of it was collected by me personally. I think there is no great assumption in that data.

Q. Is there any doubt that the data obtained by you, or assumed as the basis of your testimony up to the present time was all obtained prior to April 30th, 1906?

A. Not in my mind.

Q. Well, would you have any other doubt unless it existed in your own mind?

(No answer).

Q. What other harbors have you examined with reference to sewage pollutions than New York?

A. Are you desiring me to answer from my present knowledge, or from the knowledge which I possessed at the time of making these reports?

(Question repeated by the stenographer).

A. Up to the present time?

Q. That seems to be the question?

A. That is what I am asking you.

Q. Is there any doubt about the question?

A. Yes, I would not ask the question if I had not been in doubt in my mind about it.

Q. The language is perfectly plain?

783 A. I have examined the following harbors: New Haven, Bridgeport, Providence, New Bedford, Boston, Philadelphia in this City and in Europe, the harbors of Marseilles, Antwerp, Hamburg, Amsterdam, Rotterdam, Paris, London, Southhampton, Liverpool, Dublin, Belfast, Glasgow, Edinborough—those are all I recall now.

Q. In which one of the harbors that you have enumerated is crude sewage not discharged?

A. It is not discharged in—well, there again I must ask you to define the word "crude." Do you include screened sewage with crude sewage?

Q. Well, you are an expert, Doctor. If crude has no definition, of course you will not answer it?

A. There is no agreement among experts with respect to the use of many terms in sewage disposal. I asked my question of you merely to meet your inquiry in the most complete manner, but crude sewage is not discharged giving the word "crude" my own definition, in the harbors of Paris, London, Belfast, Antwerp, Dublin or Belfast, except in very small quantity, Hamburg, Marseilles, and my statement in that respect refers to the main body of sewage produced by the inhabitants of those ports, not to small drains which may exist, and which are outside of the main scheme of the system which the authorities have designed for the protection of the sanitary condition of the waters of the ports.

Q. What method of treatment of any kind has been applied to the sewage of Hamburg?

A. It is screened. First the sewage is collected to two central points for treatment. That in itself was a large important undertaking. The sewage is screened, before it is discharged into the harbor and a considerable amount of settlement particularly of large and coarser solid matters takes place in the grip chambers connected with the screen apparatus.

784 Q. At what depth below the surface of the harbor is the final discharge of the sewage at Hamburg?

Mr. O'Sullivan: I wish to lodge a formal objection to this whole line of questioning as not being related to the testimony of this witness in chief, and I draw the attention of the defendant's counsel to the fact that evidence of new matter that he may introduce through the present witness is inopportune in so far as this is not a suitable time to introduce evidence for the defendants and he will be bound by any new matter that he now makes this witness his own witness for.

The Commissioner: Note the objection.

Mr. Riker: Counsel for the defendants in much obliged to complainants' counsel for elementary instruction in the rules of evidence.

Q. Now, will you answer that question?

A. Yes. The exact depth is not recorded in my mind at present, but I remember it as between 20 and 30 feet below the surface of the water.

Q. Did you make any analysis yourself of the waters of the Harbor of Hamburg?

A. No, I did not.

Q. You do not know of your own knowledge what the condition as to pollution of that water is?

A. I do.

Q. You know of your own knowledge without having made any analysis yourself?

A. Yes.

Q. How do you know?

A. I have seen it.

Q. Can you state from seeing it what percentage of free oxygen it contains?

A. No.

Q. Can you tell how much free ammonia it contains?

A. No.

Q. Can you tell what the percentage of bacteria in the water is from seeing it?

A. No.

Q. You can see the color of it I suppose, can you see anything else?

785 A. Yes.

Q. What?

A. Solid matter.

Q. Solid matter floating on the surface?

A. Floating on the surface, flowing in the body of the water.

Q. Well, now, how much solid matter did you observe in the waters of the harbor of Hamburg?

A. Expressable in what unit?

Q. Anyway you please?

A. It is impossible to express it in any terms of water or volume.

Q. You cannot describe it?

A. I can.

Q. Well, describe it?

A. I saw the sewage rising from the outfalls. I saw flocks of sea birds numbering hundreds about the out-fall and standing on the shore. It was an easy matter to tell what direction the current was flowing in by the behavior of the birds which were feeding on the refuse from the sewage. By standing on the shore and looking at the water flowing by I could see particles of paper and fetal matter and other debris commonly existing in sewage flowing in the water. Noticed the currents as they came from and passed away from the outfalls. By going over to the out-falls in a boat the solid matter became visible more in quantity.

Q. When did you make these observations?

A. I made some of them last winter.

Q. And the rest?

A. About three years ago.

Q. Is the harbor of Hamburg a busy harbor?

A. Very.

Q. A great deal of shipping in it?

A. A great deal, one of the liveliest harbors in the world.

Q. What observations have you made in the harbor of Boston?

A. I visited the out-falls at Deer Island, at Nut Island and at Moon Island on maybe three or four occasions.

786 Q. What is the quantity of sewage discharged into the harbor of Boston in twenty-four hours on the average, if you know?

A. I could not tell you the exact figures at this moment. You are asking me a line of questions that I am not prepared to answer to-day specifically being without any visible relation to the testimony which I am prepared to answer on.

Q. I do not think the witness need comment on the questions. Answer the question and do not comment on them. If you cannot answer very well. You cannot answer that question, I understand?

A. Am I to abide by this gentleman's instructions, Mr. Commissioner?

The Commissioner: You are supposed to answer his questions.

The Witness: I am endeavoring to do so.

Q. Can you answer the question, what is the average amount of sewage discharged into Boston Harbor?

A. No.

Q. You have testified as to the amount discharge per hour at certain points today. Can you repeat that testimony?

A. Will you have the stenographer read it please?

Q. I have not asked the stenographer to read it. I am asking you whether you can repeat it?

A. It is impossible without making comment to meet this gentleman's inquiries. He says I have testified as to the quantities discharged into Boston harbor.

Q. At certain points?

A. Today?

Q. Per hour?

A. I do not recall having made any specific statements as to the volumes of sewage discharged there. What am I to do about that, Mr. Commissioner?

The Commissioner: Answer the question if you can; do the best you can with it.

Q. You cannot answer that?

A. No, I have not made the statement.

787 Q. Have you made personally any analyses of the waters of Boston Harbor?

A. No.

Q. Have any been made under your supervision?

A. There have.

Q. While you were present?

A. No.

Q. Where is Revere Beach with reference to the out-falls of the Boston sewage, if you know?

Mr. O'Sullivan: One moment; I do not wish to inter-upt defendants' counsel, but I wish it to appear on the record that I raise a general objection to the introduction of new matter—my objection has been disregarded, and I object to further questions along this line.

The Commissioner: Note the objection.

A. Revere Beach, is, I believe on the Harbor of Boston.

Q. How far from -he outfalls?

A. I could not tell the exact number of feet of rods or miles.

Q. Do you know a beach known as Nantasket Beach?

A. I have been there.

Q. Where is that?

A. On the Harbor of Boston.

Q. How far from the out-falls?

A. I could not give you the exact distance.

Q. Have you been there during the summer season, ever?

A. Yes.

Q. Were there crowds of people there?

A. Yes.

Q. Bathing?

A. I think there is bathing there.

Q. The testimony which you have given up to the present time on your direct examination, so far as it consisted of opinions is based upon data which was supplied to you and which you did not take yourself to a large extent, was it not?

788 A. To a large extent.

Q. What data did you examine by yourself—I withdraw

that question and ask this: You ate some shad which you caught yourself, I think -ou said?

A. I did not say so.

Q. Well, the shad which you ate you knew were caught in the river?

A. The shad I ate?

Q. Yes. That you testified that you ate, did you not testify to that; did you not testify that you ate some shad that were caught in the river?

A. No, I did not.

Q. Have you eaten any shad that were caught in the river that were caught while you were present?

A. Yes.

Q. Where were they caught?

A. They were caught in nets off Grant's Tomb.

Q. And you saw them caught?

A. I saw them taken out of the nets.

Q. And you took them home with you and had them cooked?

A. Yes.

Q. And you partook of them?

A. Yes, oh, yes.

Q. And you detected what kind of a flavor in them?

A. There were various flavors. I did not get shad on one occasion only.

Q. Well, can you state one particular time when you did have a shad which you had cooked at home and ate yourself?

A. I cannot give you the date of it; I can tell you the circumstances of it. I got the shad from the Hudson at Grant's Tomb. I brought it home and it was cooked. I tasted it but I did not eat it.

Q. What was the matter with it?

A. The flavor of it was very strong of kerosene as I think——

Q. Did you attempt to trace it to its source, that flavor of kerosene?

A. Oh, no.

789 Q. Do you think from your observation of the Harbor that kerosene is discharged through the sewers?

—. I believe kerosene is discharged through into the harbor, waste petroleum products, perhaps not properly termed kerosene.

Q. Do you mean to say that you can trace the place at which this shad contracted kerosene?

A. No.

Q. Are you willing to say in your opinion as an expert that the shad was infected with kerosene in New York Harbor?

A. Yes.

Q. Why?

A. For this reason: I do not think the shad as it comes from the ocean containes or has been in contact with kerosene or any petroleum products. On the other hand it has passed, by the time it gets to Grant's Tomb, it has passed through a harbor which does receive petroleum product wastes.

Q. At what points in your observation, your personal observation does the Harbor of New York receive petroleum wastes?

A. At various points, not one in particular.

Q. Would the petroleum wastes be indicated in analyses of the water of the Harbor?

A. Probably not, not unless there was some reasons to seek them in the analyses.

Q. Is there anything deleterious in petroleum waste?

A. I shall not want to say whether there was or not.

Q. Have you no opinion on that subject?

(No answer)

Q. Do I understand that you have no opinion on that subject?

A. I have an opinion on the subject.

Q. Doctor, if the shell fish obtained at a locality show infection in any perceptitable degree in any sample obtained, in your opinion, is it safe to take shell fish and eat them from that particular locality?

A. No.

790 Q. So that id shell fish are now infected under present conditions, *there* are not fit to eat, are they?

A. Not raw, no.

Q. And the addition of more sewage will perhaps make them more dangerous but they are dangerous just as they are, are they not?

A. I should answer that question in this way; that if shell fish contain disease germs already, the addition of more disease germs might not materially increase their danger.

Q. So that in your opinion, the shell fish that are now obtained from New York Harbor, at least from certain localities are infected to a dangerous degree?

A. Oh, yes.

Q. Where is the pollution under your observation of the surface conditions of the water—where is the pollution of the waters of the Harbor of New York most marked?

A. You want me to mention a point? I should say that the point is either Newtown Creek or the Passaic River.

Q. You do not call the Passaic River part of the waters of New York Bay?

A. You did not ask me about New York Bay.

Q. Do you call the Passaic River part of the Harbor of New York?

A. Surely.

Q. You were including the Passaic River as part of the New York Bay?

A. We do not ever consider it part of New York Bay.

Q. Then do you wish to amend your answer?

A. No, It is part of New York Harbor.

Q. Well, then, confine your attention to the waters of New York Harbor, where, in your judgment, do the surface conditions indicate the greatest pollution?

791 A. Newtown Creek or the Passaic River.

Q. The Passaic River is still part of New York Bay, is it?

(Question repeated by the stenographer as follows:)

Q. Well, then, confine your attention to the waters of New York Harbor, where, in your judgment, do the surface conditions indicate the greatest pollution?

Mr. Riker: Change it to "New York Bay."

Mr. O'Sullivan: Then I move that the answer of the witness be stricken out, the answer to the question, and the witness be permitted to answer the amended question.

(Amended question repeated by the stenographer as follows:)

"Q. Well, then, confine your attention to the waters of New York Bay, where, in your judgment, do the surface conditions indicate the greatest pollution?"

A. The east side of the Bay.

Q. Have you had occasion to use the transportation facilities in New York Harbor?

A. Yes.

Q. Did any of them use the part of the Bay which is most polluted?

A. Yes.

Q. Have you observed any effect on transportation from the pollution of the Bay at those points?

A. No, I should not expect to, traveling so little as I do on those lines.

Q. Do you know anything that indicates any effect that is, any fact within your knowledge that indicates that that condition effects the transportation in the Bay?

A. I have not sought to find it.

Q. Have you not observed that sewers of New York discharge directly into slips?

A. In some cases they do.

Q. Have you happened to observe what the slips were used for?

A. In many cases I have.

792 Q. What kind of traffic?

A. Various traffic.

Q. Ferry boats?

A. No, I do not know of any cases where sewage discharges into ferry boat slips or the slip used by ferry boats.

Q. Excursion boat slips?

A. I do not know of such cases.

Q. Ocean vessels?

A. Yes, I think freight ocean going ships.

Q. No passenger vessels that you know of use the slips into which sewers discharge directly?

A. No.

Q. Well, do you say there are no slips into which sewers empty, discharge directly, which are used by passenger vessels of any sort?

A. I do not say so.

Q. What degree of pollution of the water of New York Bay in

your opinion will produce conditions which will in any way affect passenger traffic in the waters of the Bay?

A. If the waters become foul smelling and were markedly discolored or rendered in any place dicidedly polluted, greasy, I should expect that persons should avoid traveling by the transportation lines by those points.

Q. Do those conditions which you have described, or do they not, exist in any of the slips that you have observed on the New York Shore?

A. Not where ferry boats or excursion steamers take their passengers.

Q. You have not observed any?

A. No.

Q. What ferry slips have you observed?

A. I have observed the most of those in the neighborhood of 23rd Street the Pennsylvania, the Erie and the Long Island Ferry Slips.

Q. On the East River?

A. Also the municipal ferry slips at the foot of Whitehall Street.

Q. How far is the mouth of the Gowanus Canal from a
793 ferry slip from the nearest ferry slip?

A. I could not tell you the exact distance.

Q. Is it a long or short distance?

A. It depends upon whether one is in a hurry. It depends altogether upon what one means by a long or a short distance.

Q. How far is that if you can judge?

A. I told you I did not know the distance.

Q. Cannot you approximate it, was it 100 yards?

A. It is more than that.

Q. 200 yards?

A. I cannot tell you the exact distance.

Q. Does the discharge from the Gowanus Canal affect the appearance of the waters of the East River along the Brooklyn shore for any considerable distance from its mouth?

A. Yes, a very short distance, if at all. Not a quarter of a mile, and that under exceptional circumstances, and not from the Gowanus Canal as it naturally exists.

Q. What do you mean by "as it naturally exists"?

A. I mean that the water which flows out of the mouth of the Gowanus Canal does not discolor the water of the East River.

Q. What is it that discolors the waters of the East River in connection with the Gowanus Canal?

A. Why, as far as the water is discolored at all by the Gowanus Canal, the discoloration is produced by the discharge from the flushing tunnel.

Q. How long has that been in operation?

A. Perhaps six months.

Q. Well, prior to the beginning of the operation of the flushing tunnel, did you observe the effect upon the waters of the East River from the discharge from the Gowanus Canal?

—. I never observed that there was such an effect.

Q. Did you not say that you never have seen any effect
794 from it?

A. Not that effect; no. No effect upon the waters of the East River as to discoloration from the waters from the Gowanus Canal flowing from the mouth of the Canal.

Q. What do you mean by saying that it did not produce that effect more than a quarter of a mile?

A. I was not referring to that at all. I was referring to the mouth of the flushing tunnel. To make the matter perfectly plain to you, if the discharge of Gowanus water into the East River affects the color of the water of the East River about the mouth of the East River, it does so from the Flushing tunnel, and in that case I do not consider that the water of the East River is discolored more than a quarter of a mile under the worst circumstances.

Q. And through this discolored part of the water are there any transportation lines plying?

A. You mean ferry boats? I think not.

Q. Nor any excursion lines?

A. I think not.

Q. Do you attribute the effect upon navigation to the discharge of the sewage from Flushing tunnel?

A. I have not had reason to do so.

Q. Can you point out an instance or point, at which navigation is affected in any way so far as you can tell, by the discharge of sewage into the waters?

A. Navigation would be seriously interfered with by the accumulation in tidal channels, which would narrow or make shallow the depths required for vessels.

(Question repeated by the stenographer.)

Mr. Riker: Not where it would be, but where it is.

Mr. O'Sullivan: I object to the question on the ground that it calls for opinion evidence from this witness on a subject that
795 I have not qualified him to give expert evidence on, and that he is called alone to testify as to a series of investigations and determinations of a chemical and bacteriological character prior to 1906, some long time antecedent to the operation of the Flushing tunnel, the subject of this present inquiry.

The Commissioner: Note the objection.

A. Yes, I can state instances. The Brooklyn Bureau of Sewers goes to considerable annual expense to dredge from the waters material which has been discharged from the sewer, and the Department of Docks of New York goes to considerable expense yearly to dredge from slips material which has been deposited from sewage, and the general government goes to considerable expense to dredge from the channels material which has been deposited from sewage.

Q. What proportion of the materials dredged by the Government, the general government, from the channels is sewage material?

Mr. O'Sullivan: I object to every *this* that is outside of the line of the direct testimony of this witness.

The Commissioner: Note the objection.

A. I have not made a personal determination of the amount or of the exact proportion——

Q. No, outside of the fact, as indicated by the fact that these agencies have dredged out the channel, is there any other instance that you can point to, which navigation has been affected by sewage discharge into the waters?

A. Yes.

Mr. O'Sullivan: This is all under my general objection.

A. In the construction of one of the main channels of this harbor, a part of the cost and the time consumed in the work is, in
796 my opinion, attributed to the existence of large deposits of sewage solids and harm is done to the interest of navigation by the discharge of sewage, which discolors the paint of vessels. Material harm is done and injury to navigation by the discharge of sewage in those cases where slips are filled beyond the depth proper for vessels. Material harm is done where delays to the passage of vessels is occasioned by the presence of dredging apparatus. In the interests of navigation——

Q. I am asking you for specific instances, if you recall the question?

Mr. O'Sullivan: I move that the witness be permitted to give a full answer to the question.

Mr. Riker: To give an answer to the question, but not to a suppositi-ous question which has not been asked.

The Witness: An instance or a place?

Q. Yes, that is it.

A. The Gowanus Canal would be a place.

Q. Now, confining your attention to the Gowanus Canal in what respect does the pollution of the Gowanus Canal affect navigation, outside of the effect upon the bed of the canal?

A. By the discoloration of vessels.

Q. You have seen that?

A. By the presence of dredging material in a channel already narrow and congested with traffic.

Q. Anything else?

A. Nothing that occurs to me at the moment.

Q. Have you observed in any instance where the number of passengers upon transportation vessels, like ferry boats has been or is affected by the presence of sewage in the water?

A. No. I have had no occasion to examine that question.

797 Q. Can you point to any instance in which the health of a passenger on a transportation vessel has been affected in any way by the presence of sewage in the water over which the vessel was making its passage?

A. I have never made such an inquiry.

Q. What extent of pollution, in your judgment would result in the decrease of the number of passengers by reason of its presence in the water?

A. I have already answered that question, but I will be pleased to do it again if you wish.

Q. Yes, I do not remember the answer.

A. If the water became decidedly discolored and of distinctly unpleasant odor because of sewage. If large quantities of sewage were encountered on the line of business of the ferries so that the matter came to be a subject of general and public comment, I should expect the business of the ferry company to be impaired.

Q. Have you within your knowledge any instances where such an effect resulted from such a condition; does that condition exist in the Harbor of Boston?

A. I do not think there is any ferry company going over any of the sewer out-falls in Boston Harbor.

Q. Well, I ask you whether that condition in your judgment exists in the Harbor of Boston?

A. I do not know.

Q. Is the harbor of Hamburg which you have testified to, are there ferry boats passing to and fro over that water?

A. There are many passenger boats, but not comparable with ours in numbers of passengers carried by each.

Q. Hamburg is not as large as New York, is it?

A. No.

Q. Are there any excursion boats at Hamburg, if you know?

Mr. O'Sullivan: This is all under my general objection, Mr. Riker.

798 Mr. Riker: Yes, sir.

A. Not in the sense that we have excursion boats. There are small excursion boats, but the conditions at Hamburg are so different from those of New York, that I should say in the sense of using the term "excursion boat" to indicate a large vessel carrying a great many people, that excursion boats do not exist in the Harbor of Hamburg.

Q. Well defining excursion boats perhaps a little differently call them pleasure boats. Is there traffic of that sort in Hamburg Harbor?

A. Yes, there is.

Q. From your observation have you any reason to believe that it is at all affected by the condition of the waters?

A. I should say not.

At 4:25 P. M. adjourned to November 23rd, 1911 at 10:30 A. M.
Adjourned to November 23rd, 1911, at 10:30 A. M.

799 Supreme Court of the United States, November Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONER-.

Before James D. Maher, Esq., Commissioner.

CITY HALL, NEW YORK CITY,
November 23rd, 1911.

Appearances:

Dr. William J. O'Sullivan, Special Counsel for the People of the State of New York.

Joseph Coult, Esq., and Adrian Riker, Esq., of counsel for the Passaic Valley Sewerage Commission, Defendants.

800 GEORGE A. SOPER, a witness called on behalf of the complainants, recalled for further examination, testified as follows:

Cross-examination by Mr. Riker (resumed):

Q. Doctor, when you said yesterday, that at Deer Island in Boston Harbor, there is a discharge of 38,300,000 gallons of sewage per day and that causes the water from the outlet of the sewer to be discolored over an area of 350 acres, you believe that there was that amount of sewage discharged at that point in Boston Harbor prior to April 30th, 1906?

A. I do not remember now to have said that.

Q. Well, it is one of your conclusions that you read from this book yesterday and will be found on page 88 of the New York Bay Pollution Commission Report of 1905?

A. What page do you say?

Q. Page 88?

A. Yes, I believe that.

Q. And did you state yesterday, you did state yesterday the amount discharged at that point prior to April 30th, 1906, did you not?

A. I think I did.

Q. And when you said at Moon Island, also in Boston Harbor the discharge of 22,000,000 gallons of sewage in three quarters of an hour discolored 75 acres, you believe that was true?

A. Yes.

Q. And you had it in your mind when you so testified, did you not?

A. Oh, yes.

Q. Did you find out during what number of hours per day that 22,000,000 gallons of sewage was discharged?

A. At the time when these observations were made.

Q. Well, during how many hours of the day?

A. Well, I do not know how many hours of the day, but at the time when the *the* area discolored was noticed and the other effects were observed. What I have given were rates you see.

801 Q. Yes, every three quarters of an hour is not that discharged; did you not testify that was discharged on the ebb tide? Is it not a fact that it was discharged on the ebb tides?

A. At Moon Island I think the discharge has always been in the ebb tide, but not at Deer Island, nor at Nut Island.

Q. Can you state what at that time was the average discharge of sewage into Boston Harbor at those three points of discharge?

A. I cannot at this moment tell you.

Q. You do know how much was discharged in that Island, do you?

A. I cannot tell you the figures for Nut Island.

Q. Do you know how many hours of ebb tide there are in a day?

A. Where?

Q. In twenty-four hours.

A. Where?

Q. At any point?

A. It varies very greatly, take it here in New York Harbor.

Q. How much does it vary in Boston Harbor?

A. It varies so greatly in New York Harbor, that at times of low water the water may be high, and by tide I no not mean the mere attraction of the moon and other astronomical bodies, but I mean the rise and fall of the water.

Q. Yes, that is what I mean?

A. That would vary often largely with the wind, and an exact tidal cycle is seldom observed.

Q. Do you know at the time when you were testifying to prior to, prior to April 30th, 1906, what is the average ebb tide in Boston Harbor at Moon Island, how many hours a day?

A. I do not know.

Q. So you cannot estimate the amount of discharge from that sewer on the basis of the figures that you have testified to

802 during 24 hours?

A. No.

Q. Can you approximate the amount?

A. No, not on that basis. The figures that I have given 38,300,00- gallons of sewage per day for Deer Island, I think were rates when the sewer was discharging at that rate. The water was discolored over an area of 350 acres.

Q. Was that an extraoddinary discharge at that time?

A. I think not. I think that was considered to be an average.

Q. Do you think 22,000,000 gallons for th-ee quarters of an hour at Moon Island was an average or an extraordinary discharge?

—. I should say it was an average.

Q. Would you from your observations there be able to say that 360,000,000 gallons of sewage discharged at Moon Island would be an excessive estimate during 24 hours?

A. I should not estimate on that.

Q. Well, you would not estimate on it at all, is that what you mean?

A. No, not on that score.

Q. You would not be able to form any estimate of the average daily discharge of sewage at Moon Island then?

A. No not from these figures.

Q. Now, in your conclusions you say that you said in your testimony that the subject of the Passaic Valley Sewerage Commission of New Jersey, if carried out would ultimately empy into the center of the Upper Bay 345,850,000 gallons of sewage per day from a community not adjacent to the Bay?

A. Yes.

Q. That conclusion was based upon data in your possession prior to the date of the report of 1905, was it not?

A. Yes.

Q. What facts were before you to justify your assumption of the premise that there would be 345,850,000 gallons of sewage
803 per day empty from this sewer into the center of New York Bay; where did you get those figures?

A. Why the Pollution Commission held two conferences with the Passaic Valley Sewer Commissioners and was in possession of a number of reports which had been issued by the Passaic Valley Commissioners and by their consulting engineer. An estimate was based on information obtained in that way.

Q. That is all the information or facts that you had or sought to have with reference to this matter?

A. I think so.

Q. To reach that conclusion?

A. I think so.

Q. Did you inquire into the number of inhabitants within the Passaic Valley Street, the Passaic Valley Sewerage District?

A. Yes.

Q. How many?

A. They were reported, if I remember correctly, by the Passaic Valley Commissioners themselves.

Q. Well, do you recall how many there were?

A. No.

Q. You do not know today how many there are?

A. I do not know how many were reported in the various reports.

Q. Do you know how many there were in 1906?

A. No.

Q. You do not know anything about that?

A. I do not know the exact figures, the numbers of the population.

Q. Has that any relation to the estimate of sewage to be discharged through this drain or sewer?

A. Oh, yes.

Q. Do you know the area of the Passaic Valley Sewerage District?

A. I do not.

Q. Did you ever have the area before you?

A. Oh, yes. The Passaic Valley District has been increasing. It

is not a fixed area apparently. Practically every report of the Passaic Valley Sewerage Commission, every succeeding report, has recommended a larger area.

804 Q. You are sure of that, are you?

A. No, that is my opinion.

Q. Why do you say it if you are not sure of it?

A. That is my opinion.

Q. Don't you know that the Passaic Valley Sewerage District is defined by statute?

A. I do not know it.

Q. Have you ever investigated to find out whether it was or not?

A. I have had no occasion to do so.

Q. No occasion in order to determine the probable discharge of sewage into New York Bay, to determine the area of the district from which it is to be discharged?

A. None whatever by me. The figures issued by the Passaic Valley Commission have been taken as sufficient.

Q. If you do not know the area of the district, you cannot tell the run-off, can you, of storm water?

A. Not from my own calculations.

Q. Can any one estimate the run off without knowing the area?

—. No.

Q. What was stated by the engineers or others connected with the Passaic Valley Sewerage Commissioners as to the *in*timate capacity of the drain or pipe or sewer as designed?

A. I do not remember the ultimate capacity, the exact figures are not before me.

Q. What were the figures 345,850,000 gallons; were they the maximum capacity or the average flow or what were they?

A. I think they were the maximum capacity in all probability.

Q. Did you ever hear of a discharge through a drain or pipe or sewer having a maximum capacity of any specific amount averaging anything like that amount?

A. Averaging it?

805 Q. Yes.

A. I should say not, strictly speaking. The average is somewhat below the maximum, but frequently sewers run at maximum capacity.

Q. When they are running at their maximum capacity, they are using their maximum, that is all that means, isn't it?

A. Yes.

Q. And when you put into your conclusions a proposition that this plan is going to discharge 345,850,000 gallons of sewage per day, are you not palpably making a misleading statement?

A. No.

Q. What is it then? What is the basis that justifies any such statement as that?

A. It is the opinion based on the reports of the Passaic Valley Commissioners, and secured as a member of the Pollution Commission, at meetings and conferring with the Passaic Valley Commissioners.

Q. Do you mean to say that any member of the Passaic Valley Sewerage Commissioners or any member of the Passaic Valley Sewerage Commissioners or any engineer connected with that Board ever stated to you, or in your presence, that this sewer was designed to carry 345,850,000 gallons of sewage per day?

A. I do not remember what the figures were.

Q. Are you an expert in the matter of sewage discharge?

A. I do not claim to be an expert on anything.

Q. You do not claim to be an expert on anything?

A. No.

Q. Well, what are these opinions, conclusions that you have been testifying to; have you not been testifying as an expert in regard to those matters?

A. I have not been qualified as an expert. I have been testifying upon the results and opinions which I obtained as a member of the New York Bay Pollution Commission.

806 Q. And you do not claim that your opinions are any better than my opinion or Dr. O'Sullivan's opinion or any other layman in regard to those matters?

A. That is a personal matter, which I would little prefer not to enter into.

Q. Then I will ask you in another way, not so personal. Do you claim that your opinion is of any greater value in this matter than the opinion of the average citizen of intelligence?

A. I should — that the average citizen of intelligence who had had the opportunities of getting the facts the same as I have had would reach the same opinion.

Q. What do you define as adjacent territory to the Bay of New York?

A. The Territory upon the shores of the Bay I should define as adjacent.

Q. And for what distance back from the shores?

A. A distance varying somewhat under different conditions, but included within the main immediate drainage areas immediately tributary to the waters.

Q. Do you include within your drainage area of New York Bay the Bronx Valley District?

A. No.

Q. You know that that does discharge into the waters of New York Bay, do you not?

A. Indirectly, yes.

Q. Well, where does any sewage discharge directly into the river or Bay. What do you mean by directly, in other words?

A. By directly I mean a sewer that empties into the Bay not into a river which is tributary to the Bay.

Q. How far do you extend the limits of New York Bay?

A. New York Bay extends from the Narrows to the mouth of the Kill von Kull on the west and to the north the mouth of the Hudson River and the mouth of the East River.

Q. Where is the mouth of the Hudson River?

A. At a line drawn between the Battery and a point near the ferry terminal of the Central Railroad of New Jersey.

807 Q. Then in that definition, the bulk of the Borough of Manhattan sewage is not discharged directly into New York Bay?

A. No.

Q. And is not therefore adjacent in your view of New York Bay?

A. The whole territory of Manhattan is not adjacent.

Q. Therefore it is not a proper territory to be included in direct discharge into New York Bay?

A. No.

Q. Or intermediate discharges into New York Bay?

A. That is another matter.

Q. Where was the sewage of the Passaic Valley Sewerage District, prior to the date of the 1905 report ultimately discharged?

A. Chiefly into the Passaic River.

Q. Ultimately I said?

A. Ultimately?

Q. Yes.

A. Into the ocean.

Q. And intermediate between the Passaic River and the ocean, where was it discharged?

A. I should not be able to agree with the definition that sewage is discharged into a place and then in another and then in another and subsequently into the sea. I should say that sewage that is once discharged is permanently discharged so far as the matter of discharge is concerned. With that prefacing remark, I think I can answer what you have in mind as follows: that the sewage which was discharged into the Passaic River—put it in another form if you please—the sewage was discharged into the Passaic River. The Passaic River discharged into Newark Bay. Newark Bay discharges into the Arthur Kill. The Arthur Kill discharges into the Lower Bay. The Lower Bay into the ocean. Some of the water of Newark Bay discharged into the Kill von Kull. The Kill

808 von Kull in part discharged into New York Upper Bay. New York Upper Bay chiefly into Lower Bay and Lower New York Bay into the ocean.

Q. Have you attempted to determine how much of the sewage discharged into the Passaic River reached New York Bay, what percentage?

A. The percentage, no.

Q. Did your examinations of the district indicate that it was, any of it, discharged into New York Bay by any of the Passaic River Water?

A. Well, I must ask you to make that question a little more definite.

Q. You do not understand it? A. It may have a number of different meanings.

Q. Almost anything might happen, Doctor. If you do not understand it, so that you can answer it intelligently, I will re-frame it?

A. I have asked you to do so.

Q. Did you attempt to determine whether any part of the sewage that was discharged into the Passaic River reached New York Bay?

A. Yes, that was a point of interest in connection with the analyses. It was a point of interest in connection with the tidal studies that were made.

Q. Did you determine that any did reach New York Bay?

A. The opinion was reached that there was no perceptible amount no discoverable amount of the sewage discharged into the Passaic River that reached New York Bay.

Q. Well, did you attempt to discover what did become of it?

A. Yes.

Q. Well, what did you learn from your endeavors to discover it?

A. That it was assimilated by the waters of Newark Bay.

Q. Well, did you attempt to determine the volume of the

809 waters of Newark Bay?

A. That was done by another member of the Pollution Commission. It was not within my special work, but as a member of the Pollution Commission, I saw the figures showing the volumes of water. That question was discussed among the Commissioners.

Q. Can you state the volume of water in Newark Bay?

A. I can state the figures given by one of the Commissioners whose business it was to ascertain the quantities of water ebbing and flowing in dofferent parts of the Bay, and I can repeat to you his estimate of the tidal prisms and areas.

Q. Newark Bay I am directing your attention to?

A. Yes, I am speaking of Newark Bay.

Q. Well, if you can, please do so?

A. What part of that information would you like?

Q. The capacity of the Bay. The amount of water in it.

A. By capacity and the amount of water, I suppose you mean the tidal prism, which is the matter that I referred to. It is given as——

Q. Does it mean that. Is that what it means? When I asked you capacity is that what it means in expert language, the tidal prism?

A. The tidal prism means the volume of water contained between high and low tides and the tidal prism of Newark Bay is given by Commissioner Falk of the Pollution Commission as 130,326,920 cubic feet.

Q. Did you attempt to discover the amount of free oxygen or dissolved oxygen in the waters of Newark Bay?

A. I think not.

Q. Is it your conclusion that the sewage discharged into the Passaic River and thence into Newark Bay was purified so that pollution was not perceptible while it was passing through New-

810 ark Bay?

A. That was my opinion.

Q. Now, where do you understand to be the proposed point of discharge of the Passaic Valley Sewer into New York Bay?

A. A short distance north of Robbins Reef, on the edge of the main ship channel.

Q. At what depth?

A. 40 feet I think.

Q. At the bottom of the channel, was it nor?

A. Oh, no.

Q. How far from the bottom?

A. It is on the edge, I think the channel is about 75 feet deep at that point.

Q. You have testified as to the distance of the proposed point of discharge as it was then indicated to you from various points in New York and New Jersey. Will you state again, for the purpose, in connection with this examination, the nearest point of land of New York State to the proposed point of discharge of this sewer?

A. A few hundred feet, I think under the water is in New York State, if you mean the shore.

Q. Well you have answered it I suppose as you understand it. Now, I will ask you another question. What is the nearest point on the shore of the upland of New York State to the point of discharge as proposed at the time that you are now testifying about?

A. Staten Island is the nearest point I think.

Q. How far is that?

A. I measured the distance on the map and found it to be within two miles.

Q. When *did* you say within two miles, how much variation do you propose by that?

A. Less than two miles, it is perhaps very close to two miles.

Q. What is the width of Newark Bay, did you ever try to ascertain that?

A. I do not remember the width of Newark Bay at the moment.

811 Q. Did you ever attempt—you are confining yourself to the time you are considering, what was the average depth of Newark Bay, did you ever ascertain that?

A. I should not be able to say from actual arithmetic average of the depth, but it is a shallow bay of depths ranging I should say between one and two feet to 10 feet or so.

Q. Is that the deepest point?

A. No, I think there is a 12 or 14 foot channel running through the center of the Bay of artificial construction.

Q. How wide?

A. I do not know the width of the channel, but my belief is that it is comparatively narrow.

Q. Have you ever been on Newark Bay?

A. Yes.

Q. Can you estimate for the purpose of testifying the width of Newark Bay?

A. I would rather not guess at a fact so easily ascertained with accuracy.

Q. Do you think that it is more than two miles?

A. I would rather not estimate the width at this time.

Q. What point of Staten Island is nearest to the proposed outlet of the Passaic Valley Sewer?

A. The northern most point has a number of—it is known by a

number of names according to the original settlements there. There is one that I recall that they call St. George or St. George's.

Q. How far is that from the mouth of the Kill von Kull?

A. That may be half a mile or less.

Q. Now what immediate results are you of the opinion will result from the discharge of the maximum of 345,000,000 gallons a day of sewage at Robbins Reef, at a depth of 40 feet if the project as it was before you in 1905 is carried out?

Mr. O'Sullivan: I object to the question if there is any significance in the answer, and I suggest that counsel for
812 defendants employ the figures that are higher than that, and which are set forth on page 9 of their own answer as 357,365,220 gallons of sewage, showing the difference between the estimate of this witness and their own expert of over 11,515,220 gallons, and request that counsel for defendants employ the more accurate figures as furnished by their own experts in attempting to make this estimate in the manner to be answered.

The Commissioner: Note the objection.

A. I believe that the sewage might discolor and render more or less offensive about 3,000 acres of the most beautiful and most traveled part of Upper New York Bay. On calm days the sleek, or thin film of grease from this sewer might reach Liberty Island, Ellis Island, Governors Island, and the Battery or Brooklyn, and the Staten Island shore.

Q. Now upon what do you base that conclusion?

A. Upon all the work, including the collection of data, its interpretation, the conferences held with the members of the Pollution Commission, to which I have already testified, and a large part of which is contained in Complainants' Exhibit Nos. 2 and 3.

Q. Why should the discharge of that amount of sewage in New York Harbor at a depth of 40 feet and on the edge of the Ship Canal discolor a larger area than the discharges of an equal amount of sewage into Boston Harbor discolors?

A. I do not know that the facts you have stated are correct.

Q. Well, I call your attention to your testimony as to what obtains as Moon Island, with a discharge of 22,000,000 gallons of sewage in about three quarters of an hour there is a discoloration of
813 750 acres. I have already asked you whether an estimate of 350 million gallons a day at that point would be excessive and you were not able to say that it was. Now why do you say that the discharge in New York Bay will discolor 20 times as much area?

A. Because it has been found in Boston Harbor that the amount of—that the area discolored does not vary directly with the quantity of sewage discharged, but increases more rapidly than the quantity of sewage discharged.

Q. That has been found, has it?

A. It is so reported.

Q. I direct your attention to your own conclusion which states

that at Deer Island a daily discharge of 38,000,000 gallons 38,000,000 gallons plus discolored 350 acres while a discharge at Moon Island of 22,000,00 gallons in three quarters of an hour discolored 750 acres only. Now do you conclude that the variation is as you have stated?

A. The conditions are different.

Q. The conditions?

A. Yes.

Q. What is the depth at which the sewage is discharged at Moon Island in Boston, if you know?

A. It is discharged at the surface.

Q. Does that result in a more pronounced discoloration than if it were discharged at a depth of 40 feet?

A. Yes.

Q. And the more widespread discoloration?

A. Yes.

Q. What is the depth at which the sewage is discharged at Deer Island in Boston Harbor?

A. About 7 feet.

Q. Would that result in a more pronounced discoloration of the surface than if it were discharged at a depth of 40 feet?

A. Yes.

Q. Is the sewage in Boston Harbor outlet discharged vertically or is it discharged horizontally?

A. It is discharged vertically.

814 Q. Do you know how the project as presented to you up to 1905, to the date of this report, by the Passaic Valley Sewerage Commissioners proposed to discharge?

A. It was ver- difficult to find that out or to get other definite information concerning the method of discharge. The opinion I think was reached by me at the time that the engineer had not decided upon that matter for the Passaic Valley Commissioners.

Q. Then you do not know?

A. I know merely what my impression was.

Q. I say you do not know?

A. I do not know what the discharge was.

Q. How was it proposed to discharge?

A. With respect to horizintal or vertical discharge?

Q. Yes.

A. I do not know, but I may have at the time.

Q. In your opinion would it make any difference whether it discharged horizontally or vertically?

A. Yes.

Q. Would it affect the dispersion of the sewage?

A. It would.

Q. Now beside and beyond the discoloration of an area of the surface of New York Bay, what other immediate results do you say would result from the discharge of sewage as it was proposed under the plan of the Passaic Valley Sewerage Commissioners when it was under your consideration, up to the date of the 1905 report?

A. I believe that there would be foul odors produced at the point of out-fall.

I believe that there would be solid matter easily recognizable as of sewage origin coming to the surface at that point.

(Question repeated by the stenographer.)

815 A. I believe there would be a film of grease at the surface, and I think there would be solid matter deposited in the Harbor from the sewage. Those are the most important results which I should anticipate.

Q. Did you prior to the 1905 report, March 31st, 1905, examine the free baths in the Harbor of New York, or any of them?

A. Yes.

Q. Where were they located?

A. There is one located at the Battery on Manhattan Island.

Q. Do you know of any others?

A. I cannot name you the exact location in that year of all the public baths of the City of New York. They vary you know, from year to year and there are a good many of them.

Q. Were they or were they not in the Borough of Manhattan and the Borough of Brooklyn?

A. They were.

Q. How far?

A. Pardon me. They were also in the Bronx at that time.

Q. Now, in the ones that you have observed on the shores of the Borough of Manhattan, how far were the baths out beyond the pier line?

A. They were not beyond the pierhead line.

Q. Were not beyond the pierhead line?

A. No, in no case that I recall at the moment.

Q. Were they between the bulkhead line and the pierhead line?

A. Yes.

—. But not in the actual slip, were they?

A. I am trying to find what you mean by "Actual slip." They were between the piers.

Q. Well, I mean one that was built?

A. Yes.

Q. Out of the pierhead line?

816 A. A slip? A slip I understand by that—I should like you to tell me what you do. A slip I understand to be a space between two piers run from the shore line towards the main channel. That is my understanding. Is that what you mean by actual slip?

Q. Yes.

A. That is where the baths were for most part, in the slips between the bulkhead line and the pierhead line.

Q. Now where do the sewers from the Borough of Manhattan discharge with reference to the pierhead line or the bulkhead line?

A. Thy discharge almost exclusively within a very few feet of the pierhead line.

Q. And do they discharge at a depth below the surface of the water as you have observed, or at a high or low tide?

A. At mean low water.

Q. At mean low water?

A. Yes.

Q. And these baths were, up to the date that I have drawn your attention to, being operated by the City of New York, at the points you now testify?

A. Quite so.

Q. Do you think that the discharge of sewage at Robbins Reef from the Passaic Valley Sewer will have any possible effect on the conditions of those baths?

A. I do not think those baths will be there after a very short time. The City Department of Health I understand has refused permits for the location of the baths.

Q. So that New York City itself by its operations in the line of sewerage discharge has rendered its shore front unfit for bathing?

A. That has been so in the past.

Q. Now you have referred in your conclusions to recreation grounds. On page 87 of your report, which I think you read, or practically used the same language in your conclusions testified to yesterday—you said that unrestricted pollution of the Bay
817 would destroy the healthfulness and attractiveness of the parks and the recreation piers which were built by the City of New York on the water front for the benefit of the poor. Where do you find that these recreation parks and recreation piers were located?

A. There are many; do you wish me to name some of them?

Q. I will put a general question which may avoid the necessity of that. Are any of the piers located anywhere than *of* the water?

A. The Piers?

Q. Yes.

A. I should say not. The recreation piers are over the water.

Q. And are any of the parks that would be affected by the pollution of the water located anywhere on the water?

A. By on the water, you mean, I suppose, with a water front?

Q. Yes.

A. I should say they were.

Q. So that you referred in that 21st conclusion, or did you not, to places located on the water front?

A. I think those which are located on the water front—a few are on the water front.

Q. And the ones that you refer to in this conclusion are not?

A. The ones upon the water front are the ones that I have referred to in the conclusion.

Q. Now, where with reference to these piers and the recreation parks,—recreation parks and recreation piers that you refer-ed to, are the sewer outlets from the City of New York?

A. That is a very large question, if you wish me to be specific about it. I shall have to produce maps and report. There are a good many recreation piers and there are a good many sewer out-

lets. I should say that the question was not susceptible of a simple and direct answer.

818 Q. Are they located as a general thing, from your observation at the time as to which you are testifying, within the polluted water front of the city of New York?

A. In part they are, not all of them.

Q. Well, where are there any which are not so located, which were not so located prior to March 31st, 1905?

A. I think Pelham Bay Park is one of them.

Q. Well, now take Pelham Bay Park. Would that be in your judgment in any way by any possibility affected by the discharge of the Passaic Valley Sewer at Robbins Reef?

A. Not in a practical way, certainly.

Q. Now, where is there any other recreation pier or park that was not within the limits of the polluted district in 1906?

A. I think the City had a park fronting on Gravesend Bay which was not within the polluted district.

Q. In what way would that sight be affected by any possibility by the discharge of the Passaic Valley Sewerage Commissioner's swer at Robbins Reef?

A. In this way that solid floating matter might be carried to that—to the shores of the park from the Passaic Valley Sewer, and I should say that any large increase in the amount of polluting matter entering Upper New York Bay would be likely to increase what ever objectionable qualities existed in the water at that point.

Q. Can you state how far that point is from the point of the proposed discharge in 1905 of the Passaic Valley Sewer?

A. I cannot state that exactly, but I can tell you that that point is nearer to the Narrows than Norton's Point which I testified yesterday received drift wood and grease balls and other refuse from the water of Upper New York Bay.

819 Q. Well cannot you tell me approximately how far it is from Robbins Reef to the proposed outlet of the Passaic Valley Sewer?

A. I would rather not guess at a distance so easily ascertained with accuracy.

Q. Is it less than five miles?

A. I would rather not guess at it at this time.

Q. Have you any opinion on the subject?

(No answer.)

Q. Is *that* any other park or recreation pier that you remember that was outside of the polluted water front of New York City in 1905, up to March 31, 1905?

A. In order that my answer may satisfy your requirements will you please tell me what you mean by the polluted water front of New York City.

Q. I mean the water front into which the local sewers of the city of New York discharge?

A. There was a park on the shore of Upper New York Bay running from the Narrows along the South Brooklyn shore, and immediately upon the water front, and I think there was some sewer

dischargeing in the immediate vicinity of that park. There is also the Battery Park at the southern-most end of Manhattan Island.

Q. That is not within the pollution district?

A. There is no and was no sewer discharging on the water front of that park at that time, nor I think within a distance of perhaps one eighth of a mile of it.

Q. You are willing to guess at that distance, are you?

A. My office overlooks the park.

Q. Is it susceptible of ascertainment?

A. I do not pretend that my estimate of one eighth of a mile is accurate.

Q. But you are willing to guess at it?

A. I am willing to make the statement which I have for your benefit.

820 Q. Now, turning to the recreation piers. Were there any up to March 31, 1905, which were not located within the district which is polluted by the direct discharge of sewage from New York City?

A. I should say not, and by polluted I assume you mean that a sewer discharged within a distance of about one eight- of a mile.

Q. Do you think these recreation piers will be in any way affected by the discharge of the Passaic Valley sewer at the point indicated at Robbins Reef?

A. I should not wish to say that the nearest recreation piers would be, but it seems to be the policy of the City of New York to construct more recreation piers and to provide more parks on the water front for the benefit of the public, and any considerable addition to the amount of polluting material which may hasten the time when that beneficial policy would have to be abandoned, would be objectionable in my opinion.

Q. I direct your attention to the fact that this examination is directed to your conclusions as to the parks and recreation piers, which have been built by the City of New York on the water front for the benefit of the poor, and now I ask you to confine your testimony to those piers and those parks in answering the question as to whether or — in your judgment the discharge of sewage at Robbins Reef from the Passaic Valley Sewer as outlined up to March 31st, 1905, would in any way affect these structures at those places?

A. Yes.

Q. In what way?

A. By adding materially to the amount of polluting matter entering the water.

Q. Do you mean to — that any of the sewage from that sewer would reach those piers or recreation parks?

A. The evil consequences of discharging that sewage might— whether you prefer to say that the sewage would as sewage

821 reach those piers, or whether the solid matters coming from the sewage or other impure matters from the sewage would do so indirectly.

Q. Do you mean by that that those things would be perceptible under conditions which exist from the free discharge of untreated

and crude sewage from the sewers of New York Harbor upon the surface of its water within one eight- of a mile of those piers and the recreation park?

A. I cannot answer that question.

(Question repeated by the stenographer.)

Q. Mr. O'Sullivan: One moment, I object on the ground that the question is ambiguous.

The Commissioner: Note the objection.

The Witness: I cannot answer it because the meaning of the question, the information which it may intent to elicit is not clear to me.

Q. It is intended to elicit your opinion, Doctor?

A. If you will state your question clearly enough for me to understand it, I will undertake to give you my opinion.

Mr. Riker: You said you cannot answer it. It will be left to the court to say whether it is understandable.

Q. Is it your opinion that the present method of discharging sewage by the Borough of Manhattan, into the waters of the Hudson River and New York Bay up to March 31st, 1905 was the best that could be adopted?

A. Is it my opinion that that was the best that could be adopted?

Q. Yes.

A. No, only in one respect.

Q. Well, what is that respect?

A. That the sewage was discharged at a great many points, and in comparatively small volume at each.

822 Q. With that exception is it your opinion that the method is a desirable one, or was a desirable one, up to the date indicated?

A. No.

Q. What percentage of the dissolved oxygen in your opinion was exhausted up to March 30th, 1905, by the discharge of sewage into New York Bay?

A. At what point?

Q. All points?

A. There was apparently a considerable difference in the amount of dissolved oxygen exhausted from the water depending on the point where the sample was taken.

Q. Did you take a sample of the water at Robbins' Reef?

A. I will.

(The witness examines report.)

You are speaking now up to March 1905, referring to that part. I do not recall that samples were taken at Robbins' Reef for analyses for free oxygen.

Q. At the estimated increase of population within the territory which you have defined as adjacent to New York Bay, how long in your opinion will the sewage from that population discharged directly into New York Bay be digested?

A. One moment. You mean if the sewage were to be discharged,

I suppose, not will be, and be digested you mean without producing offensive conditions. I have never made an estimate of that.

Q. You have made an estimate that it is capable of at least digesting sewage for the coming 25 years, have you not?

A. That was an opinion, but not quite apparently as you have in mind. The length of time I should say would be at least 25 years.

Q. I refer you to the eleventh conclusion on page 85?

A. Yes.

823 Q. It is not likely to be polluted; how much longer than 25 years?

A. I should not be able to say that.

Q. Why not?

A. Because it is a very complicated question. It involves a greater number of considerations. It is a far more difficult matter to say and to conclude upon than I feel qualified at this time to attempt.

Q. Well, how did you qualify yourself to make an estimate of 25 years?

A. Why 25 years at least and the Bay is not likely to be polluted.

Q. That is your opinion?

A. My opinion was that it was not likely to be polluted to such an extent that a general nuisance would occur for at least 25 years.

Q. What did you base your figures of 25 years on; how did you reach that guess?

A. That opinion was based on a review of the visible probable rates of growth of population and of all the essential facts concerning the quality of the water.

Q. Now, having those before you, having had those before you at the time of this repirt, can you not now make another estimate of the length of time?

A. No.

Q. You are not willing to venture an opinion or a guess beyond 25 years.

A. No.

Q. What conditions of the water was that estimate based on?

A. Conditions that have been reported and are included in my testimony given with respect to the work done by the Pollution Commission and largely contained in Complainants' Exhibits Nos. 2 and 3.

Q. And it involved the discharge of the sewage from New York City at or about the pierhead line at the mean low tide?

A. No.

824 Q. What then?

A. Not that alone.

Q. Did it involve any change in the sewers of New York City?

A. Yes.

Q. What?

A. It was believed that there would be a change and that the sewage of New York would not continue to be discharged in crude form without a central regulation and control.

Q. And your estimate of 25 years, in making that you had that in mind?

A. Had it in mind that the communities adjacent to the shore would take reasonable precautions to keep their sewage from discharging in crude condition into the waters, and under objectionable circumstances.

Q. Did that apply to the Borough of Manhattan?

A. We are speaking of the territory immediately adjacent to the Upper New York Bay.

Q. No, I am not speaking of that now. I am directing your special attention to one part of it which is the discharge of sewage on the shore of the Borough of Manhattan. Did you in making this estimate include in it an estimate or a brief that that *that* sewage would be discharged other than it is now being discharged or was being discharged at the date of this report?

A. It was believed that there would be an improvement in the methods of dealing with the sewage by New York City.

Q. Now just what changes did you assume as one of the data for your estimate of the 25 years?

A. The nature of the changes and the extent to which changes would be necessary were considered by the commission far beyond their power to determine at that time.

Q. Why did you limit your conclusions and estimate by some such statement if that was part of your estimate and conclusion?

825 A. It did no*r* seem necessary to do so.

Q. Did you make any independent examination prior to March 31st, 1905 of the under-run in New York Harbor, New York Bay. I am particular about those words "Harbor" and "Bay." It makes a great difference.

(Question repeated by the stenographer.)

A. I do not know what is meant by that question.

Q. You do not?

A. I do not know. I do not know what you mean by independent investigation for one thing.

Q. Did you make any investigation at all of the underrun?

A. Such facts as could be obtained from the analyses that I have reported that were extracted in order to form an opinion concerning the under-run, but the existance of an under-run, its width and depth and rate of progress, and the circumstances in alteration of those conditions, were not made the subject of special investigations by me.

Q. You simply took the report of Mr. Mitchell, did you not?

A. Simply took it for what?

Q. As the basis of your conclusions as to the under-run?

A. That is all I have reported it as. Henry Mitchell called attention to the existance of what he considered an under-arm if what he believed to be facts with respect to it, as I have reported, and as has been explained in my testimony, what his opinions were.

Q. They are not your personal opinions at all except so far as you adopt his?

A. So far as the rate of progress is concerned, I should say that that is Henry Mitchell's view alone. He expressed or suggested

that the sewage being discharged into the Harbor might be carried up and stored in the deep pot holes in the Hudson. I have not expressed any personal approval of that opinion, nor do I think
826 in my testimony or in my report I have given any emphasis to Henry Mitchell's view of that.

Q. Have any observations or experiments been made at Robbins Reef so far as you know to determine the existence of an under-run at that point?

A. Not for that specific purpose.

Q. Or direction of the under-run if any exists?

A. I should think that my answer to the first question would answer the second. I do not know of any studies that have been made of Robbins Reef with that special point of view.

Q. Do you know whether any studies have been made of the under-run in the East River?

A. I am not aware of any studies especially directed to the existance, width, depth, direction and alterations in those conditions of an under-run in the East River.

Q. Up to the date of your 1906 report had you made any experiments of the dispersion of the discoloring matter on the surface of the waters of New York Bay at Robbins Reef?

A. The 1906 report, I think not.

Mr. Riker: That is all.

Redirect examination by Mr. O'Sullivan:

Q. Doctor, Mr. Riker asked you what knowledge you had of the area of the Passaic Valley Sewerage District, and asked you some questions as to how you could compute the run-off, if you did not know the area. Now I ask you this question: the drainage and the run-off of the Passaic Valley Sewerage District is it wholly immaterial to the capacity of the Passaic Valley Sewer on account of the fact that the storm water is not to be admitted to the sewer to the official plans of the Passaic Valley Sewerage Commission?

A. Yes.

827 Q. So that the area and the run-off would not aid you in determining what the maximum discharge of that trunk sewer would be?

A. No.

Q. The New York Bay Pollution Commission, what appropriation did it have to do its work?

A. I think it had first an appropriation of $2,000 and later an appropriation of $1,000.

Q. And that Commission was organized to investigate and report to the Legislature?

A. It was.

Q. And did it report in the form of offering or submitting a bill for the creation of a larger commission with more extended powers and a larger appropriation to continue the investigations?

A. A draft of such a bill accompanied the report of the Pollution Commission, known as Complainants' Exhibit No. 2, and a recom-

mendation that such a commission be appointed was embodied in the main report itself.

Q. And is it a fact that facts such as you acquired relative to the Passaic Valley Trunk Sewerage scheme were acquired up to 1906 from conferences which you testified you had with the Passaic Valley Sewerage Commissioners, and from such reports as they had made up to that time?

A. Yes, largely.

Q. If I recall you testified that D. D. Jackson did the analytical work under your direction?

A. Yes, that is correct.

Mr. O'Sullivan: That is all.

Mr. Riker: One question, Doctor.

Recross-examination by Mr. Riker:

Q. Having eliminated from the Passaic Valley Sewerage Commissioners' Sewer the run-off of storm water, can not you tell what the average sewerage per inhabitant is?

828 Mr. O'Sullivan: I object to that, that is clearly ambiguous. The average inhabitant has no sewage. He may create a discharge of sewage through a sewerage system.

Mr. Riker: You are dealing with words; you are quib-ling about language.

Mr. O'Sullivan: I object to the question on the ground that it is clearly ambiguous and misleading.

Mr. Riker: I ask that the question be amended so as to read "sewage" and ask that this witness answer it.

(Amended question repeated by the stenographer as follows:)

"Q. Having eliminated from the Passaic Valley Sewerage Commissioners' Sewer the run-off of storm water, cannct you tell what the average sewage per inhabitant is?"

A. No.

Q. Don't you know what is estimated to be the average amount of sewage per inhabitant?

A. I do not know what it was from the Passaic Valley District at that time.

Q. I ask you if you know now what is estimated to be the average sewage per inhabitant?

A. Where?

Q. In any place?

A. For your information I will tell you that it varies.

Q. Not for my information, for the information of the Court?

A. I should hardly think the court needed that. The sewage of any city varies per capita from any fixed rate. The quantity of sewage per capita varies in different cities and in the same city at different seasons of the year and in different hours of the day, and in the same part of any city a rate of flow of sewage may vary with respect to all of the factors that I have mentioned. That is

829 for what I have termed strictly domestic or household sewage. And where as in the Passaic Valley Sewer District large

quantities of trade waste are included in the total sewage volume, the variations may be still greater. It is impossible for me to state the number of gallons of sewage per capita as the volume of sewage per inhabitant, produced.

Q. Now in your eleventh conclusion in estimating the sewage that is likely to — discharged in to New York Bay during the next twenty-five years, what sewage per capita did you estimate on?

A. I do not remember.

Q. You did take some definite average per capita for New York City, did you not?

A. I do not remember that I did.

Q. Then how did you arrive at your estimate?

A. The volume of sewage per capita is not the only way in which to form an opinion of the amount of polluting material which sewage contains.

Q. What did the increase in the estimated population of New York City have to do then with the question of sewage within the next 25 years?

A. The question of New York City was not alone considered in arriving at the opinion expressed.

Q. Well, taking the whole territory adjacent to the New York Bay. What amount per capita of sewage did you estimate during the next 25 years?

A. No specific volume of sewage was taken as a basis of that opinion, for the reasons that I have already testified to.

Q. What did the increase in population have to do with the question then?

A. The larger the population, the more the polluting matter.

830 Q. And at what rate per capita?

A. Approximated at a uniform rate.

Q. Of what?

A. So far as this estimate was concerned.

Q. Of what?

A. Of polluting material.

Q. What was that uniform rate?

A. For example I think perhaps it would meet your view a little more accurately than I can be by answering you- specific questions if——

Q. I would prefer that you should answer my specific questions, if you can. If you cannot, why do not attempt to answer them. I do not want you to answer something that I have not asked. If you cannot answer the question, do not answer it.

A. What question do you wish me to answer?

Q. The last one I asked you. I asked you—I forget the exact words—some rate you said was fixed, and I wanted to know what that rate was?

A. There was no fixed rate. I have said that and I repeat that.

Q. No uniform rate was fixed?

A. In my eleventh conclusion I state a general opinion in very

general language. I say the Bay is not likely to be polluted to such an extent——

Mr. Riker: You are not answering the question at all. I move that the answer be stricken out.

Mr. O'Sullivan: I move that it be allowed to stand.

Mr. Riker: Of course we cannot stop it here unfortunately. He can go on talking as long as he likes. There is no way I can stop him.

The Witness: I say the Bay is not likely to be polluted to such an extent that a general nuisance will occur for 25 years at least, if it — used solely for the discharge of sewage from the communities which are adjacent to the shores.

831 Mr. Riker: I move that the answer be striken out on the ground that it is entirely irresponsive to the question asked and is entirely volunteered.

Mr. O'Sullivan: I object to its being striken out, on the ground that it is clearly responsive.

The Commissioner: Note the objection, both objections.

Q. Assuming a population of one million inhabitants within the Passaic Valley Sewerage District, and that the project as outlined to you involves only sanitary sewage, what in your opinion would be the discharge from that population through this sewer into New York Bay at Robbins Reef?

A. It is impossible to estimate the volume of the sewage on the data given.

Q. You mean you cannot do it?

A. I did not mean that any one could not. I was testifying on my own opinion.

Q. It is impossible for you to do it?

A. On my own facts.

Q. You never estimated the amount of sanitary sewage per capita of population in any given place?

Mr. O'Sullivan: I object to this, as it is clearly a conflict of terms, sanitary sewage.

Mr. Riker: It is a term generally used by engineers, sanitary sewage.

Mr. O'Sullivan: Sewage is essentially unsanitary.

(Question repeated by the stenographer.)

A. What do you mean by sanitary sewage?

Q. Do you not understand the term?

A. I ask you what you mean?

Q. I am asking you whether you understand the term?

A. I understand the term as used by some. I do not understand the term as used by you.

832 Q. Well, you do not have to answer it if you do not understand it, if that is what you mean?

A. I am asking you to clarify your question.

Mr. O'Sullivan: I think this witness is entitled to be addressed in intelligible form when a question is formulated asking his opinion.

(Question repeated by the stenographer as follows:)

"Q. You never estimated the amount of sanitary sewage per capita of population in any given place?"

A. I wish to be informed of your meaning of the term "sanitary sewage."

Mr. Riker: My meaning is the meaning that is ordinarily attached to it. If it has not any ordinary meaning you cannot answer it, if it has, why answer it.

Mr. O'Sullivan: I renew my objection.

The Commissioner: Note the objection.

Mr. O'Sullivan: I object on the ground that the witness is entitled to be asked an intelligently formulated question without conflict in its very terms.

Mr. Riker: I am waiting for the answer; if you cannot answer it, say so.

(No answer.)

Mr. Riker: That is all.

Redirect examination by Mr. O'Sullivan:

Q. Doctor, sewage when calculated per capita has a wide range per capita, has it not, as to volume?

A. It has.

Q. Running from 40 gallons per capita to 1,000 gallons per capita, according to a given community and the local industries in that community?

A. The range is very wide.

833 Q. And it is clearly empiric whenever a given per capita amount of sewage is used as a basis of estimate for any community?

A. Yes.

Q. What do you understand by the term "Sanitary" Doctor?

Mr. Riker: I object on the ground that this witness has refused to answer a question involving that term on the ground that he does not understand it.

The Commissioner: Note the objection.

A. Healthful, making for health. The word comes from sanus which means health.

Q. You are familiar with such an expression as "sanitary sewage"?

A. I have heard it used. I do not employ it myself.

Q. Do you regard sewage under any condition as sanitary?

A. I do not.

Mr. O'Sullivan: That is all.

Mr. Riker: That is all.

834 DANIEL D. JACKSON, a witness called on behalf of the complainants, being first duly sworn, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. What is your full name?
A. Daniel D. Jackson.
Q. Where do you reside?
A. 930 President Street, Brooklyn.
Q. Have you pursued any line of study at any time to equip you for any vocation?
A. I graduated from the Massachusetts Institute of Technology in Chemistry and lectured there in Biology afterwards. I was biologist for the Massachusetts State Board of Health; bacteriologist for the City of Worcester, and chemist for the Boston Water Supply, and I have had charge of the Lab-ratories for the Department of Water Supply, Gas and Electricity for New York City for several years.
Q. Did you have a lectureship in any of these institutions?
A. I lectured in Microscopical Analysis at the Institute of Technology.
Q. You are now occupying some official position, are you?
A. I am directing the Lab-ratory of the Department of the Water Supply, Gas and Electricity.
Q. Where are the lab-ratories?
A. The lab-ratories are in Brooklyn and Mount Kisco and Jamaica.
Q. Are you in charge of these lab-ratories?
A. Yes.
Q. What are your functions as director of these lab-ratories?
A. The sanitary supervision of the Water Supply of Greater New York and the analytical work connected with supervision. Also the examination of the various sewage plants in the water shed.
Q. And that is part of your daily work, is it?
835 A. Yes, sir.
Q. Are you connected with the International Hygienic Congress of Applied Chemistry?
A. I am secretary of the Division of Hygiene for that Congress.
Q. Have you any connection with the American Public Health Associations, Doctor?
A. I am Chairman of the Committee for standard methods for the examination of water and sewage of the American Public Health Association.
Q. Does that body prescribe methods for the general bacteriological and biological chemists?
A. It does.
Q. To make their determinations with?
A. It does.
Q. Are those regarded as the standard methods in the proofs of chemistry and bacteriology?
A. Yes, sir.

Q. And what is your association with that American Public Health Association?

A. I am chairman of the Committee which standardizes those methods, have been for 3 years.

Q. Have you at any other times qualified as an expert on water supply and sewage disposal?

A. Yes, sir.

Q. Were you ever connected with the New York Bay Pollution Commission, Doctor?

A. I made the examinations for that commission, under the direction of Doctor Soper.

Q. What examinations did you make? What general character had those examinations as to whether they were chemical or bacteriological or both?

A. They were a chemical and bacteriological, both.

Q. And what samples did they consist of?

A. In the first report they consisted of about 50 samples of water taken from various portions of the Upper and Lower Bay, and 51 samples of oysters taken from the various oyster beds affected.

Q. Now what methods did you follow in sampling the water?

A. The methods laid down and published by the Ameri-
836 can Public Health Association at that time. They have been somewhat modified since.

Q. Now will you describe, doctor, the methods that you employed in making your examinations of the water samples?

A. The various samples were collected by me personally, and wherever necessary tests were made on the ground. The samples were taken to the lab-ratory as soon as possible after collection and the various examinations which were made were made by the then standard methods. Examinations were made for the various conditions of the organic matter present, the amount of salinity of the water and the numbers of bacteria and the numbers of intestinal organisms present.

Q. What method did you employ in examining the samples of shell fish that you have testified to?

A. The shell fish were taken from the grounds, removed at times by the men who were then at work on the shell fish, and they were taken to the lab-ratory and sterilized on the outside and opened with sterile knives and the liquid inside the shell was examined. This liquid was examined for the numbers of bacteria for the presence of colon bacillus, intestinal germs.

Q. What objective did you have in determining the number of B. Coli?

A. Their presence is an indication of sewage pollution, the presence of the colon bacillus in the oysters represent in a way the degree of pollution which the water has at that point.

Q. Do you regard it as an important factor in arriving at the conclusion as to whether or not a given water had been polluted by sewage, if you find these invariably in numbers in the sampl-s?

A. I do. They act as a filter, and give a very good index
837 as to the quality of the water in their vicinity.

Q. Doctor Jackson, I hand you complainants' Exhibit No. 2 and Complainants' Exhibit No. 3 and ask you if you have compared the tables as printed in these two exhibits with such notes as you took at the time you made the determinations that you have just now testified to?

A. I have, and except for a few printer's errors, they are correct.

Q. Will you direct attention to those printer's errors, so that they may be corrected on the record?

A. I——

Mr. Riker: I would like to ask the witness some questions as to his testimony on the contents of the two tables.

Mr. O'Sullivan: All right sir.

Cross-examination by Mr. Riker:

Q. Where are the original reports?

A. At Mount Prospect Lab-ratory.

Q. Are they accessible?

A. Yes, sir.

Mr. Riker: I object to the use of the copies.

The Witness: The original analyses are in note books which are distributed through quite a long series, and which I have examined and compared with these figures. It would take a great many hours to check them up in any other way. In fact it took me four or five hours.

Mr. Riker: I am sorry but it seems to be the rule of law as I understand it. The originals are the best evidence.

The Witness: The figures of course are also distributed depending on the salinity, and so forth.

Redirect examination by Mr. O'Sullivan:

Q. At the time you made these determinations both chemical and bacteriological, in the examinations that you have described of both water samples and shell fish samples did you make noted of the results of your chemical and bacteriological determina-
838 tions at the——

A. Yes, sir.

Q. And in what form *as* those notes now?

A. They are distributed in note books mixed with a great many other analyses which were being carried on at that time.

Q. And they are part of the records of the Mount Prospect Laboratory?

A. *There* are part of my personal record books.

Q. And they are numerous?

A. There are some four or five of them I think.

Q. Four *of* five of them?

A. They are distributed all the way through these various books.

Q. And have you recently compared the tables as set forth in complainants' Exhibit No. 2 and Complainants' Exhibit No. 3 with those note books?

A. I have.

Q. Made by you?

A. I have.

Q. And how did you find them on a comparison?

A. Substantially correct except for the printer's errors which I have indicated on this examination.

Q. Will you now state what corrections as to printer's errors are made, for these two exhibits, so that they may conform exactly to the actual notes.

Mr. Riker: I renew my objection at this time.

The Commissioner: Note the objection.

Q. So that they may conform exactly to the actual notes taken at the time?

Mr. Riker: I object to the use *od* this document as it appears now by the witness' testimony that the originals are not only accessible, but they have been within his possession for examination within a time sufficient- recent to enable him to say that the printed book is a copy.

The Commissioner: Note the objection. Proceed.

839 The Witness: On page 51 of Complainants' Exhibit No. 2, table 1, the word "ebb" in the last colume should be "flood." The first of the columns of Ebb and Flood for bacteric. The second and third columns for B. Coli. Evidently a printer's error.

On page 52 table No. 2, samples number 13, it should be 5440, that is 5440, instead of 5400, a very immaterial difference.

Q. Due to what?

A. Due to a printer's error undoubtedly.

Q. Misplacing the decimal point?

A. Misstating the result, it was 5400, should — 5440. I am simply making those corrections because they are slightly different from the original figures.

On page 53, table No. 3, page 55, table No. 4, Page 56, table No. 5, ther- are no corrections.

Q. Did you find them to conform accurately to your notes?

A. I did, except for those corrections. Those tables which I have testified to are not all. Page 59, table No. 7, the first three analyses were made by me. The others collaborated from various sources.

Table No. 9, page 62, table No. 10, page 63, those two have no corrections. Table No. 11, page 64, no corrections.

Q. Just confine yourself to the ones that are corrected?

A. That is all for this report.

Q. Now, direct your — complainants' Exhibit No. 3, I ask you if you compared the tables in that exhibit with your notes?

A. I have.

Q. And if so, state what the results were?
A. Page 14, table No. 1——

Mr. Riker: The same objections to the use of this document.
840 The Commissioner: Note the objection.

The Witness: Number 55 under B. Coli the results are positive, negative and positive in the three dilutions. It should read "Negative, positive and positive" in the dilutions of the one tenth, one, and 10 cubic centimeters used. They interchanged for a positive a negative result merely in the analysis.

Q. What page is that?
A. 14, table No. 1. No. 55.
Q. That was No. 55?
A. Yes, sir. Instead of "Positive negative, positive" it should read "Negative, positive, positive" for three dilutions. Table No. 7, page 21, No. 154, that sample should read "9120" instead of "9130," *and* immaterial correction of course. And No. 164 B. Coli test should be "Negative, positive, positive" instead of three positives.
Q. How should that *that* be again?
A. Negative, positive, positive. Zero plus plus instead of three pluses.

On page 25, table No. 11, samples Nos. 103 and 104, the figures against those two results should be interchanged.

On page 26, table No. 12, the figures for free ammonia in Nos. 132, 133, and 134 should read ".460, .400, .300" the figures printed having been interchanged by the printer.

On page 30, table No. 17, sample No. 130, the figure for dis-olved oxygen should be "4.86" instead of "7.86." This is the only material error. That of course makes a material difference. The others are immaterial so far as the idea goes. That was all.

Mr. O'Sullivan: It is now 12:45 and perhaps we had better take an adjournment for recess.
Mr. Riker: Will you please explain to me the reason for the adjournment?
841 The Commissioner: Mr. O'Sullivan requested it?
Mr. Riker: Oh, a personal reason, that is different.
Mr. O'Sullivan: Well, go right on,—we will go right on Mr. Commissioner that is a very peculiar insinuation.

By Mr. O'Sullivan:

Q. Doctor, under whose directions did you make these collections of samples?
A. Under Dr. Soper's directions.
Q. Will you open the map in connection with these samples and state the points at which you took the samples and give the hours for the various samples.

Mr. Riker: I do not know but what I want to ask the witness some questions about the map. Did you make those notations on the map yourself?

The Witness: I made those notations *of* the original map, yes.
Mr. O'Sullivan: From which these are copies?
The Witness: Yes.
Mr. O'Sullivan: And you compared these with the original?
The Witness: Yes.
Mr. Riker: Where is the original map?
The Witness: The original was merely a tracing in the office indicating the points at which the samples were taken and the various time- at which they were taken and given to Dr. Soper.

Mr. Riker: I object to the use of this copy.
The Commissioner: Note the objection.

By Mr. O'Sullivan:

Q. Now, Doctor, will you take the samples and as you have made the corrections, will you describe what you did and what you found following the table.

Table No. 1, Page 51.

(As printed.)

Map No.	Point of collection.	Bacteria per c. c.		Tests for B. Colli.					
				Ebb tide.			Ebb tide.		
		Ebb tide.	Flood tide.	0.1	1.0	10	0.1	1.0	10
1	North River at head of Pier 1	45,300	21,300	x	x	x	x	x	x
2	South of Liberty Island	28,000	15,600	0	x	x	x	x	x
3	Near Robbins Reef	24,900	16,300	0	0	x	0	x	x
4	Narrows	26,100	8,900	x	x	x	0	0	0
5	Off Gravesend Bay	27,900	12,900	0	x	x	x	x	x
6	South of Sea Gate	7,800	1,810	0	x	x	0	0	0
7	Iron Steamboat Co.'s Pierhead, Coney Island	6,200	1,900	x	x	x	0	x	x

Complainants' Exhibit No. 2.

Table No. 1, Page 51.

(As corrected)

Map No.	Point of collection.	Bacteria per c. c.		Tests for B. Colli.					
				Ebb tide.			Flood tide.		
		Ebb tide.	Flood tide.	0.1	1.0	10	0.1	1.0	10
1	North River at head of Pier 1	45,300	21,300	x	x	x	x	x	x
2	South of Liberty Island	28,000	15,600	0	x	x	x	x	x
3	Near Robbins Reef	24,900	16,300	0	0	x	0	x	x
4	Narrows	26,100	8,900	x	x	x	0	0	0
5	Off Gravesend Bay	27,900	12,900	0	x	x	x	x	x
6	South of Sea Gate	7,800	1,810	0	x	x	0	0	0
7	Iron Steamboat Co.'s Pierhead, Coney Island	6,200	1,900	x	x	x	0	x	x

844 Take each table in its order and describe what directions you got, what you did in consequence of the directions and what method you employed, and what results you obtained, and state very fully where these results appear?

A. The results on table No. one were taken from the Coney Island Steamboat Company's Boat, in a trip from pier No. 1 to Coney Island during the ebb tide, and then on the return trip on the flood tide, taking samples at the points indicated in the map.

Q. And known by what numbers?

A. Known by the numbers 1 to 7. A sample was taken at practically the same point both at the flood and at the ebb tides as indicated on this table under the numbers 1 to 7, between pier No. 1 and Coney Island. The bacteriological results and the determination for intestinal organisms are given in that table.

Q. What page is that table on?

A. On page 51.

Q. Of complainants' Exhibit No. 2?

A. Yes, sir.

Q. Who took the first samples indicated on the map as number one?

A. I collected all of the samples my self.

Q. All the samples marked on the map, 1, 2, 3, 4, 5, 6 and 7, is that right?

A. Yes, sir.

Q. And at what points did you collect these?

A. The points are indicated on the map as given in the table. In the North River at the head of pier No. 1, No. 2, south of Liberty Island, No. 3 near Robbins Reef, No. 4 at the Narrows. No. 5 at Gravesend Bay, No. 6 south of Sea Gate, No. 7 Coney Island, off the Coney Island pier.

Q. Are the locations from which the samples were taken accurately located on the map?

A. Sufficiently so for the object at hand. They were not

845 located by instruments, simply located on the map at the time of the collection according to my judgment as to off what points — were. These locations were made at the time of course.

Q. Now, Doctor, will you state what methods you employed in determining the number of bacteria per cubic centimeter as it appears in the first two columns of that table marked under the heading of ebb and flood tide?

A. The samples are collected in sterilized bottles and taken to the lab-ratory, where a cubic centimeter of each sample of each is placed in liquified jelly and the jelly if then allowed to harden and the number of growths of bacteria are determined after two days at 20 degrees temperature, after a growth of two days.

Q. I want you to speak up as if we had never heard of this, so that we can get exact knowledge of it?

A. These bacteria grow in the jelatin just as molds grow in cheese and where ever vacteria existed in the water it becomes the point of infection on the jelatin forming a spot there which can be readily seen, the number of spots being based on a count after two days'

time. Those numbers are considered the original numbers of bacteria in the water.

Q. How do you make the count, Doctor?

A. They are counted directly with the eye on the plate. The number of spots are very easily distinguishable from each other.

Q. Now taking the tests for the B. Coli appearing in the third, fourth, fifth, and sixth, seventh and eight- columns of that table No. 1 on page 51 of Complainants' Exhibit No. 2, will you state how you made the tests for B. Coli?

A. Three separate tubes were inoculated with three different volumes of the water, one tenth, one and ten cubic centimeters.

846 The liquid in the tubes consisted of a sugar and an extract of meat. The bacteria in the samples growing in this liquid media, would, if they were colon bacillus, produce a gas in the medium, which would collect in the top of the tube. The presence then would become evident after incubation at blood heat *heat* for two days. The positive results represented by plus signs show their presence in the dilutions indicated. The zeros show their absence. Their presence in all three dilutions indicates material contamination. Their presence in the two dilutions, a contamination of a lesser degree. In the one dilution, or the ten cubic centimeters, of a still less, and where they are absent in all three it shows no contamination, or at least less than would be found in ten cubic centimeters.

Q. To whom did you report the result of your determinations for bacteria per cubic centimeter and for B. Coli as they appear in the table No. 1 on page 51 of Complainants' Exhibit No. 2?

A. To Dr. Soper.

Q. And does that table conform to the report furnished Dr. Soper and now found as table No. 1 in tabular form?

A. It does.

Q. And did you compare that with your notes as taken at the time?

A. I did.

Q. And did you find it corresponded with the notes?

A. I- every respect, except in the corrections which have been indicated.

Q. I call your attention, Doctor, to table No. 2, appearing on page 52——

At 1 P. M. Adjourned for Noon recess to 2 P. M.

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CITY HALL, November 23rd,
Afternoon Session—2 p. m.

DANIEL D. JACKSON a witness called on behalf of the Complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan (Resumed):

Q. I call your attention to table No. 2 appearing on page 52 of Complainants' Exhibit No. 2 and ask you how you collected the samples that are tabulated in that table?

A. I collected the samples and analysed them personally. The

samples were taken from a boat, the trip being made specially for the purpose and the points at which the samples were taken are numbered and given in the table as follows: St. George, end of East Pier, Tompkinsville, end of South Pier. Stapleton Yacht Club Dock. The next sample is between Stapleton and Clifton. No. 12 is Rosebank, No. 13 the Narrows above Fort Wadsworth, that is three quarters of a mile above Fort Wadsworth, No. 14, east of Fort Wadsworth No. 15 south of Fort Wadsworth, three quarters of a mile. No. 16, South Beach at the upper end. No. 17 South Beach at the middle. These samples were taken sufficiently off from the beach itself, so as not to take into account material directly on the beach. Shall I describe the results?

Q. Yes, go right along?

A. The bacteric at Fort George show 26,400 per cubic centimeter. There is a gradual diminution in general from these figures down to the middle of South Beach, where the influences of the lower Bay became more evident, the contamination above being greater than below.

COMPLAINANTS' EXHIBIT No. 2.

Table No. 2, Page 52.

(As printed.)

Map No.	Point of collection.	Bacteria per c. c.	Tests for B. Colli. 0.1	1.0	10
8	St. George, end of east pier	26,400	x	x	x
9	Tompkinsville, end of south pier	14,600	0	x	x
10	Stapleton, yacht club dock	22,000	x	x	x
11	Between Stapleton and Clifton	12,800	0	x	x
12	Rosebank	9,300	0	0	x
13	Narrows above Fort Wadsworth (¾ mile)	5,400	x	x	x
14	East of Fort Wadsworth	5,350	0	x	x
15	South of Fort Wadsworth (¾ mile)	6,500	x	x	x
16	South Beach, upper end	5,900	0	0	x
17	South Beach, middle	6,800	x	x	x

Complainants' Exhibit No. 2.

Table No. 2, Page 52.

(As corrected.)

Map No.	Point of collection.	Bacteria per c. c.	Tests for B. Coli. 0.1	1.0	10
8	St. George, end of east pier	26,400	x	x	x
9	Tompkinsville, end of south pier	14,600	0	x	x
10	Stapleton, yacht club dock	22,000	x	x	x
11	Between Stapleton and Clifton	12,800	0	x	x
12	Rosebank	9,300	0	0	x
13	Narrows above Fort Wadsworth (¾ mile)	5,440	x	x	x
14	East of Fort Wadsworth	5,350	0	x	x
15	South of Fort Wadsworth (¾ mile)	6,500	x	x	x
16	South Beach, upper end	5,900	0	0	x
17	South Beach, middle	6,800	x	x	x

850 The bacteriological results show that very considerable pollution in all of the samples except off Rosebank and the upper end of South Beach, where a moderate amount of pollution is found.

Q. Do these map numbers indicated in the first column correspond with the locations plotted on the map in Complainants' Exhibit Nos. 2 and 3?

A. They do.

Q. Who made the examination for the determination of bacteria per cubic centimeter in the third column of that table, No. 2, appearing on page 52?

A. I did.

Q. Have you compared those figures with your original notes taken subsequent to the securing of the sample and its examination?

A. I have, and with the exception of one figure which has just been corrected they are the same as those in the original notes.

Q. Now, taking the fourth, fifth, and sixth columns of table No. 2 appearing on page 52, being tests for the bacillus Coli, who made the determinations or tests for that bacillus?

A. I made them personally.

Q. Have you compared the records of those tests as they appear in that table No. 2 with your original notes?

A. Yes, sir, they are the same as the original notes.

Mr. Riker: I would like to have it put on the record that all this testimony is taken subject to my formal objection against the use of the copy instead of the original.

The Commissioner: Note the objection.

Q. To whom did you furnish the data containing in your original notes?

A. To Doctor Soper.

Q. And was this table made by Doctor Soper or by you, this tabulation appearing in Table No. 2 at page 52 of Com-

851 plainants' Exhibit No. 2?

A. It is tabulated substantially the same as it was transmitted to him.

Q. By whom?

A. By me.

Q. Dr. Jackson, I wish to direct your attention to Table No. 3, appearing on page 53 of Complainants' Exhibit No. 2.

Mr. Riker: Is that marked Table No. 3 in your book?

Mr. O'Sullivan: Yes.

The Witness: It is marked Table No. 3 just above it.

Mr. Riker: Yes, Table No. 3 is in the paragraph.

Q. I ask you who collected the samples that are indicated by sample number and location in that table?

A. I collected the samples and made the analyses personally, and they were collected in sterilized bottles and examined by standard methods, the results showing the examinations of the water from vari-

ous points between Fort Hamilton and Sea Gate and representing the amount of pollution which exists in and about Gravesend Bay.

Q. What were the points of collection used as a basis for that?

A. No. 18 was taken at Fort Hamilton.

Q. Doctor, you say No. 18; what does that No. 18 mean?

A. That is the number on the map. You will note that in all these tables the samples are numbered from 1 up. In table No. 1 from there are numbers from 1 to 7, and on table No. 2 from 8 to 17. In table No. 3 it begins with sample No. 18.

Q. And did you yourself plot the samples taken and indicated in the first column of Table No. 3 appearing on page 53 of Complainants' Exhibit No. 2. Did you plot these samples according to the numbers appearing in that column on the map?

A. I did.

COMPLAINANTS' EXHIBIT No. 2.

Table No. 3, Page 53.

(As printed.)

Map No.	Point of collection.	Bacteria per c. c.	Tests for B. Coli.		
			0.1	1.0	10
18	Fort Hamilton, 100 feet south	6,480	x	x	x
19	Fort Hamilton Beach, 100 feet S. of W. end	3,360	0	0	0
20	Fort Hamilton Beach, 100 feet S. of E. end	3,180	0	0	x
21	Off Field and Marine Club, 20 feet from raft	2,900	x	x	x
22	100 feet off Avoca Villa Pier	4,900	x	x	x
23	150 — off beach below Captains' Pier	7,500	x	x	x
24	100 feet off Pier of N. Y. Canoe Club	4,300	x	x	x
25	75 feet off Public Camp Ground	8,600	x	x	x
26	Opposite Coney Island, 300 feet from shore	5,700	0	0	0
27	Opposite Coney Island, half way across the Bay	8,800	x	x	x
28	North of Pier of Atlantic Yacht Club	8,500	0	x	x
29	Opposite Sea Gate, 200 feet North	8,200	0	0	x
30	Opposite Seat Gate, 500 feet North	8,900	0	0	x

853 Q. You yourself?

A. Yes, sir, those were plotted at the time the samples were collected and the position of the samples is indicated by the numbers on the map.

Q. Where was sample No. 18 collected?

A. Sample No. 18 was taken 100 feet off Fort Hamilton.

Q. Will you state where the other samples in that table were taken?

A. Sample No. 19 100 feet south of the west end of Fort Hamilton Beach. Sample No. 20, 100 feet south od the east end of Fort Hamilton Beach. Sample No. 21 off Field and Marine Club, from a raft which is used for sea purposes. Sample No. 22 was taken 100 feet off of Avoca Villa Pier in Gravesend Bay. Samples No. 23 150 feet off the Beach below Captains' Pier. Sample No. 24 100 feet off the pier of the New York Canoe Club. Sample No. 25 75 feet off the Public Camp Ground. Sample No. 26 opposite Coney Island, 300 feet from the shore. Sample No. 27 opposite Coney Island, half way acorss the Bay. That is a little Bay on the Map here shown between the two. (Indicating on map.) Sample No. 28, north of the pier of the Atlantic Yacht Club on Coney Island. Sample No. 29 opposite Sea Gate, 200 feet north. Sample No. 30 opposite Sea Gate, 500 feet north; these samples are taken consecutively all the way around Gravesend Bay and represent the condition of the water throughout the Bay.

Q. At the time they were taken?

A. At the time they were taken.

Q. Will you state, Doctor, how you collected these samples and what you did with the samples after you had collected them?

A. The samples were collected from a boat specially hired
854 for the purpose. They were collected in sterilized bottles and shipped in ice to the laboratory where the examinations were made for the numbers of bacteria, and for the amounts of intestinal germs present.

Q. You say they were shipped to the lab-ratory, what lab-ratory?

A. They were taken to the lab-ratory personally—I should say.

Q. What lab-ratory?

A. Mount Prospect Lab-ratory in Brooklyn.

Q. How is that lab-ratory as to equipment?

A. It is probably the best equipped water lab-ratory in the world.

Q. Is it a small or large lab-ratory?

A. It is a — lab-ratory and has the very best of all the appliances for this work, and there are present three or four men who are continually experimenting on methods and means of improvement in analytical results and the general methods used there are those which are either standard at the time or to be standard for some future time. Many of the standard methods have originated there.

Q. And later been adopted by whom?

A. And later adopted by the American Public Health Association.

Q. Now, what did you do with the samples after they got to this Mount Prospect lab-ratory; those particular samples on Table No. 3 appearing on page 53 of Complainants' Exhibit No. 2?

A. The samples bottles were moved from the cases still cold from the shipment in ice, and the sterilized covers were carefully removed, and duplicate samples taken for bacteria. Sampling was obtained from sterilized pipettes measuring different quantities of the water and taken into sterilized dishes. To these dishes were then added
the sterilized gelatin meat preparation which had been previ-
855 ously warmed so that it was in liquid form. This liquid gelatin was then poured in with a definite amount of the water thoroughly mixed with it. The whole liquid was then covered with a sterilized cover and allowed to harden. As soon as the gelatin became solid it was placed in the incubator at 20 degrees which is kept at a definite temperature of 20 degrees centigrade, and the samples there remained for forty-eight hours, after which they were removed and the various growths which then appeared in the gelatin were counted. That represents the figure for bacteria per cubic centimeter, counts being made in duplicate so as to give a more accurate result. At the same time that the waters were planted in the gelatin for the bacteriological count, other portions of the water were removed by sterilized pipettes and placed in tubes containing a liquid medium, composed of beef juice and dextrose, in the case of the first report, and in the case of the second report of bile solution, bile lactose, which was found to give rather more uniform results. That is the standard method has changed somewhat between the first and the second report. The amounts of water which are usually taken for this purpose are one tenth of a cubic centimeter, one cubic centimeter and ten cubic centimeters. This gives a wide variation and admits of an interpretation as to the quantity of pollution and the relative number of intestinal germs present. These tubes are placed in the incubator at blood heat for 48 hours and at the end of this time if intestinal organisms are present, the sugar in the liquid has become fermented and a gas is formed which shows in the
top of the tube. The presence of this gas is a direct indication
856 of pollution from intestinal organisms. In the table wherever the plus sign is given it represents that a positive test was obtained in that dilution and whenever a zero is given, a negative test was obtained. If the sample is highly polluted the positive tests will be shown in all three dilutions, and what is given as plus, plus, plus indicates a very considerable amount of pollution of intestinal origin.

Q. You state that the Mount prospect Lab-ratories sometimes invent or create standards that are later adopted by the profession. Have you yourself ever invented any method along the lines you are now testifying, such as the bile lactose method?

A. The bile lactose method was developed by myself, as giving more refinite results than the original solutions, used particularly with waters, which were badly contaminated. The natural medium of intestinal germs is the fluids of the intestines, and the bile is contained in considerable amount in those fluids. It was found by experiments that solutions representing the amount of bile naturally present in the gall bladder itself was the best medium for the growth

of these volumes. Consequently this was substituted for the meat juice, which was previously used.

Q. And has that method been recognized and accepted since?

A. It has. It is now used in most lab-ratories and has been accepted as the standard. Such solutions are used also for the determination of typhoid fever and Asiatic cholera, it having been found that in so far as both of those organisms are intestinal that they grow very readily in that medium, more so than other organisms and therefore crowd out the common bacteric and make them selves evident in growing in that fluid.

857 Q. Have you contributed to the literature of your profession along these lines and has that literature been printed and circulated by the Federal Government?

A. I have written some work for the United States Geological Survey which has been printed, and I have written some papers on the analyses of water, and allied subjects, for some eight or ten scientific magazines. In all I think I have contributed about 50 or 60 papers on this subject.

Q. On the subject we are now discussing?

A. Yes, sir.

Q. To whom Doctor, did you report the results that appear on table No. 3 at page 53 of Complainants' Exhibit No. 2?

A. To Doctor Soper.

Q. Have you compared that table with your original notes?

A. I have.

Q. With what results?

A. It is entirely correct, as printed.

Q. You plotted the map numbers appearing in the first column?

A. I plotted the map numbers myself on a map which was submitted to Doctor Soper, from which all of the various samples were collected and placed on this map. These various tables represent as a rule different tests which were taken at different times and at various sections of the Upper and Lower Bay, and tributaries.

Q. Directing your attention to the paragraph just above table No. 3, beginning with the word- " Table No. 3 as it appears on page 53 of Complainants' Exhibit No. 2, give the date at which the samples were collected, also giving the hour and the condition of the tide. Do they appear in that paragraph?

A. They do. The results of the examinations of the waters taken from various points between Fort Hamilton and Sea Gate in Gravesend Bay. The samples were collected from a boat along the

858 shore, October 20th, 1904, between 1:45 P. M. and 3:45 P. M. through the middle of the rising tide. The tide was high at Sandy Hook at 4:52 and at the Narrows at 5:22 the wind was light to fresh east to south, with a maximum volocity of 13 miles per hour. Those are Doctor Soper's observations *observations*, not my own.

Q. As to the wind?

A. Yes, sir. That is taken from the Meteorological map at that time.

Q. And every thing except the direction and volocity of the wind, who took those?

A. I did.

Q. Going back to table no. 2, which appears on page 52 of Complainants' Exhibit, I direct your attention to the last paragraph on page 51 of that Exhibit. I would ask where the samples that went to make the tabulation of table No. 2 were collected?

A. The samples were collected from the ends of piers at docks along the shore on October 17th, 1904, between 12:25 and 3:40 P. M. Toward the end of the flood tide, through slack water, and the beginning of the ebb.

Q. Those observations were made by whom, that you have just read?

A. By myself.

Q. Going further back to table No. 1, Doctor, which appears on page 51 of Complainants' Exhibit No. 2 I direct your attention to the concluding paragraph of page 50 of that Exhibit and ask when the samples were collected that appear in tabulated form in table No. 1 at page 51?

Mr. Riker: Before he answers that I would like to ask a question or two.

Mr. O'Sullivan: All right.

Recross-examination by Mr. Riker:

Q. Was that map made by you?

A. Yes, sir.

859 Q. That is a copy of the memoranda made by you?

A. Yes, sir.

Q. In those exact words?

A. No, not my exact words. I simply took the time from my watch and indicated at what time each sample was taken.

Q. That is not a copy of the memoranda, is it?

A. On each sample was indicated the time at which the sample was taken.

Mr. Riker: I object to your using that for the purpose of refreshing your memory.

The Commissioner: Note the objection.

Redirect examination by Mr. O'Sullivan:

Q. State between what hours the samples were collected.

A. The samples were taken between 10 and 11 A. M. on ebb tide and between 4 and 5 P. M. on flood tide. This table was intended to indicate the condition of the water at ebb tide and at flood tide and you will note in the results—generally speaking at flood tide in the Upper Bay, the large numbers of bacteria found on the flood tide are about one half of that number found of ebb tide. In a general way an indication of the dilution is given there. Naturally the figures on the flood tide being less than on the ebb, but still the

figures on the flood show a very material contamination during the flood.

Q. Now, Doctor, direct your attention to table No. 4, which appears on page 55 of Complainants' Exhibit No. 2. I ask you who collected the samples that appear in the tabulated form in that table?

A. The samples in table No. 4 were collected personally by me and examined by me.

Q. When, Doctor?

A. Results of the examination taken from various points

Table No. 4, Page 55.

(As printed.)

Map No.	Point of collection.	Bacteria per c. c.	Tests for B. Coli. 0.1	1.0	10
31	Stapleton Dock	7,690	0	0	0
32	Off Rosebank	6,980	0	x	x
33	Narrows, 100 feet off Fort Wadsworth	14,400	x	x	x
34	Between Hoffman Island and South Beach	6,780	x	x	x
35	Off Creek above Midland Beach	5,100	x	x	x
36	Off Elm Tree Beacon	2,300	0	0	0
37	Between Elm Tree Beacon and Great Kills	1,040	0	0	0
38	Great Kills Point	990	0	0	0
39	Great Kills	920	0	0	0
40	Great Kills, near shore	1,600	0	0	x
41	South of Great Kills	2,340	x	x	x
42	Off Latourette Point	2,620	x	x	x
43	Off Sequine's Point	1,650	0	x	x
44	Princess Bay	2,460	0	x	x
45	Lemon Creek at Bridge	12,600	x	x	x
46	Lemon Creek, 500 feet above bridge	13,800	x	x	x
47	Off Red Bank, S. I.	2,560	0	0	x
48	Off Ward's Point	40,100	x	x	x
49	Between Ward's Point and Tottenville	51,300	x	x	x
50	Off Tottenville	59,700	x	x	x

861 between Stapleton dock and the point off Totenville, Staten Island, October 22nd, 1904. The samples were collected between 1 P. M. and 5:40 P. M.

Q. Where was sample No. 31 collected?

A. Sample No. 31 was collected off Stapleton Dock.

No. 32 off Rosebank. No. 33, the Narrows, 100 feet from Fort Wadsworth. No. 34 between Hoffman Island and South Beach. No. 35 off creek above Midland Beach. No. 36 off Elm Tree Beacon. No. 37, between Elm Tree Beacon and Great Kills. No. 38, Great Kills Point. No. 39, Great Kills, No. 40 Great Kills, near shore, a previous sample being taken in the center of the Kills. No. 41, south of Great Kills. No. 42 off Latourette Point. No. 43, off Seguine Point. No. 44 in Princess Bay. No. 45 in Lemon Creek at the bridge. That sample was taken because the oysters drank at that point, and it was more relationship to the oyster examinations than to this general series.

Q. Will you explain what you mean by the term "drink" at this point, Doctor?

A. It is a term which the oyster men use for the process of transplanting the oysters from salt to brackish or fresh water.

Q. And this was one of the locations, was it, where they did the transplanting?

A. Yes.

Q. And they permit them in that way to drink?

A. They say they drink them or they plump them. Those two terms are used.

Q. Now sample No. 46?

A. Sample No. 46 Lemon creek, 500 feet from the bridge. That is also taken in connection with the oyster examinations. Sample No. 47 off Red Bank, Staten Island. These are all off Staten Island. No. 48 off Ward's Point. This bridge *in* down into Raritan River. No. 49 between Wards Point and Tottenville. No. 50 off Tottenville, and in the Arthur Kill.

862 Q. Now what did you do with these samples that you collected at the point you have just testified to?

A. These samples were collected in the same manner and examined in the same manner as previously described.

Q. By whom?

A. As previously described by me, in describing the tables which come before table No. 4. They were carefully collected in sterilized bottles and examined under the most approved conditions attainable at that time.

Q. Did you examine them in the Mount Prospect Lab-ratory?

A. I did.

Q. In what manner?

A. The samples were taken in sterilized bottles.

Q. The exact language, just the fact, Doctor, I want the facts to appear on the record?

A. The samples were carefully collected from a boat in sterilized bottles.

Q. That is not quite what I mean. The fact that I want to ap-

pear is that you subjected them to a similar examination as those you have already described, only I want it to appear for each table?

A. The samples were examined in precisely the same manner as described for the previous determination.

Q. Of the other tables?

A. In the other tables. There was no difference in the method of examination throughout this exhibit No. 2.

Q. Now, who made the determinations as to the bacteria in the third column?

A. Those determinations were made by me personally.

Q. And who made the tests for the B. Coli appearing in the Fourth, fifth and sixth columns?

A. I made — also personally.

Q. And to whom did you report?

A. All of these samples were reported to Doctor Soper, and they have been checked and found to be exactly the same as appear on the original records of the Lab-ratory.

863 Q. Have you compared this table as it appears in Complainants' Exhibit No. 2 at page 55 of that exhibit, have you compared that table with the original notes?

A. I have.

Q. And with what results?

A. The figures are precisely the same.

Q. Who did the map plotting for the various samples indicated at table No. 4?

A. At the time these samples were taken, the map of Staten Island was taken in the boat and each sample was collected a cross was placed at the point on the map where the samples were obtained. This map was afterwards submitted to Dr. Soper who transcribed the results on his own map.

Q. Doctor, directing your attention to table No. 5, appearing on page 56 of Complainants' Exhibit No. 2, I ask who collected the samples on which the tabulation of Table No. 5 is based?

A. The samples in Table No. 5 are the examinations of the liquid obtained from oysters at the points given in the table. There are also six examinations *was* to sterilize the outside covering of the oyster and then carefully open the oyster with a sterilized knife, and remove from the oyster a measured portion of the liquid from the inside of the shell. This liquid was examined just as the samples of water previously described were examined, by transplanting them into sterilized gelatin and into sterilized sugar solutions, and the results obtained indicate the degree of contamination of the clams and oysters at the points given. The six samples of clams obtained from Gravesend Bay gave two positive results in the ten cubic centi-

COMPLAINANTS' EXHIBIT No. 2.

Table No. 5, Page 56.

(As printed.)

Point of collection.	Date.	Number of shell-fish examined.	Number of positive tests for Coli. 0.1 c. c.	1.0 c. c.	10 c. c.
Gravesend Bay, Sea Gate	Oct. 20	6 clams	0	0	2
Gravesend Bay, Sea Gate	Oct. 20	6 oysters	1	2	4
Gravesend Bay, Bath Beach	Oct. 20	5 oysters	0	1	2
Off Elm Tree Beacon	Oct. 22	6 oysters	1	3	4
Swash Channel	Oct. 22	6 oysters	0	0	2
Great Kills	Oct. 22	10 oysters	0	0	1
Princes Bay	Oct. 22	6 oysters	0	1	2
Princess Bay, "drunk" in Lemon Creek	Oct. 22	6 oysters	3	5	6

meter dilutions. The six samples of oysters showed a much
865 higher degree of contamination, and were taken from a different point, the oyster bed being farther to the south, and the clam beds being in the north portion of the Bay as indicated on the map. These oysters in Gravesend Bay were shown to be sufficiently contaminated to be considered dangerous for use, and fewer and fewer oysters are taken from this point each year, partially on account of the objection to taking them from this Bay and partially because they do not seem to longer grow readily at this point. That is information obtained from the oyster men while the samples were being collected. The five oysters examined from Bath Beach which is also in the extreme upper portion of the Bay were found to be contaminated also to the extent of at least—the oysters were contaminated in the ten centimeter dilution, and in as high as the one cubic centimeter dilution. The six samples of oysters from Elm Tree Beacon were also found to be contaminated to a very considerable degree. The oysters obtained in the Swash Channel were slightly contaminated, and those obtained in Great Kills, out of ten oysters examined only one was found to give positive results of intestinal organisms. Great Kills, you will note on the map is between the two points of contamination on the south east shore of Staten Island. The one source of pollution coming from the Marrows and the other coming from the Arthur Kill and the Raritan River. Then, going south the oysters show a greater degree of contamination, and at Princess Bay that is indicated. The last samples show a very excessive contamination of the oysters due to the fact that they were drunk in Lemon Creek which is a very badly contaminated stream. I understand from the oyster men, that this is not now used, or
is little used at least for this purpose. That since these ex-
866 aminations were made the oysters taken from Great Kills are drunk elsewhere.

Q. You use the term "drunk" Doctor, the oysters where drunk?

A. I simply used that term the oyster man uses.

Q. I want you to spread upon this record what you mean by that term in connection with oysters?

A. When the oyster is taken from salt or brackish water and placed in fresher water it bloats up due to the change in the specific gravity of the water, and the oyster drinks in a large amount of fresh water, becomes plump or lighter in color and more presentable in appearance. It is done to the increase of the bulk of the oyster and to improve its appearance.

Q. And that operation is known to the oyster men as drinking?

A. Yes, sir.

Q. And when the oyster has partaken of this fresh water he is said to be drunk?

A. Yes, sir.

Q. You used the term——

A. Some people use the term, the term "drink" is used by the oyster men. Bloated is the better term for it.

Q. In employing the terms "drink" or "drunk" you are employing terms that are used and are familiar to oyster men?

A. Yes, sir.

Q. You used the term several times, Doctor, "contaminated". I ask you contaminated by what.

A. Contaminated by intestinal germs. That is germs from the intestines of warm blooded animals. The test covered that.

Q. And would these come from human or animal excretions?

A. They must come from animal or human excretions.

Table No. 6, Page 59.

(As printed.)

Point of collection of sample.	Date.	Free ammonia.	Albuminoid ammonia.
Sea water		.057	.124
Quincy Bay, Massachusetts		.056	.124
Atlantic Ocean, 3 miles southeast of Sandy Hook Light ship	Feb. 27, 1903	0.64	.076
Off Boston Light Ship	Nov. 11, 1902	.012	.068
Sewage		45.4	7.5
Good drinking water as high as Hudson River		.013	.16
At Poughkeepsie		.020	.137

Table No. 6, Page 59.

(As corrected.)

Point of collection of sample.	Date.	Free ammonia.	Albuminoid ammonia.	Chlorine.
Sea water		.057	.124	
Quincy Bay, Massachusetts		.056	.124	
Atlantic Ocean, 3 miles southeast of Sandy Hook Light Ship	Feb. 27, 1903	.064	.076	16,250
Off Boston Light Ship	Nov. 11, 1902	.012	.068	
Sewage		45.4	7.5	
Good drinking water as high as Hudson River		.013	.16	
At Poughkeepsie		.020	.137	

869 Q. Who collected the samples of the 51 specimens of oysters and clams gotten in the waters of Lower New York Bay to which you have now testified in describing Table No. 5 appearing on page 56 of Complainants' Exhibit No. 2?

A. I collected them all, samples of oysters and clams, and examined them all personally.

Q. Are the dates in the second column of that table correct?

A. Yes.

Q. To whom did you report the result of these examinations, of these oysters or clams, Doctor?

A. These results were reported to Dr. Soper.

Q. Did you prepare this table No. 5?

A. Substantially so, yes.

Q. Did you compare it with the original notes made subsequent to these examinations?

A. I did, and the figures are entirely correct.

Q. Dr. Jackson, I now direct your attention to Table No. 6 appearing on page 59 of Complainants' Exhibit No. 2 and ask you what that table represents?

A. That table represents a collection of analyses from various sources. That is not my personal work. It is taken from the report of Mr. Clark.

Q. And Mr. Whipple and others?

A. Mr. Whipple, and from the report of the commissioners on an additional water supply for New York City and from a report on the Charles River Dam at Boston.

Q. And for the purpose of establishing convenient standards?

A. Merely so.

Q. I direct your attention to Table No. 7 as it appears on page 59 of Complainants' Exhibit No. 2, and ask you who collected the samples in that table?

A. The first three samples, numbers 1, 4, and 7 were collected by me personally and were examined by me.

COMPLAINANTS' EXHIBIT No. 2.

Table No. 7, Page 59.

(As printed.)

Map No.	Point of collection of sample.	Tide.	Date.	Free ammonia.	Albuminoid ammonia.	Chlorine.
1	Pier No. 1, North River	Ebb	June 11, 1904	.210	.100	6,550
4	Narrows	Ebb	June 11, 1904	.120	.120	8,100
7	Coney Island	Ebb	June 11, 1904	.170	.170	11,250
	Hudson River at 30th Street	Ebb	Feb. 26, 1903	.168	.164	7,200
	Battery	Ebb	Feb. 26, 1903	.124	.152	9,800
	Battery	Flood	Feb. 27, 1903	.144	.180	8,150
	Robbin's Reef	Ebb	Feb. 26, 1903	.084	.140	11,225
	Robbin's Reef	Flood	Feb. 27, 1903	.170	.260	11,225
	Narrows	Ebb	Feb. 26, 1903	.132	.112	11,950
	Narrows	Flood	Feb. 27, 1903	.144	.180	9,800
	Rockaway Bell Buoy	Flood	Feb. 27, 1903	.096	.088	14,850
	West Bank Light	Ebb	Feb. 26, 1903	.128	.132	12,450
	Sandy Hook Light	Ebb	Feb. 26, 1903	.052	.092	14,700
	Opposite Sandy Hook Light	Flood	Feb. 27, 1903	.072	.108	15,300
	Average			.129	.143	

Table No. 7, Page 59.

(As corrected)

Map No.	Point of collection of sample.	Tide.	Date.	Free ammonia.	Albuminoid ammonia.	Chlorine.	
1	Pier No. 1, North River	Ebb	June 11, 1904	.210	.100	6,550	
4	Narrows	Ebb	June 11, 1904	.120	.120	8,100	
7	Coney Island	Ebb	June 11, 1904	.170	.170	11,250	
	Hudson River at 30th Street	Ebb	Feb. 26, 1903	.168	.164	7,200	
	Battery	Ebb	Feb. 26, 1903	.140	.152	9,800	100 feet
	Battery	Flood	Feb. 27, 1903	.124	.180	8,150	off
	Robbin's Reef	Ebb	Feb. 26, 1903	.147	.140	11,225	
	Robbin's Reef	Flood	Feb. 27, 1903	.127	.260	11,225	
	Narrows	Ebb	Feb. 26, 1903	.132	.112	11,950	
	Narrows	Flood	Feb. 27, 1903	.144	.180	9,800	
	Rockaway Bell Buoy	Flood	Feb. 27, 1903	.096	.088	14,850	
	West Bank Light	Ebb	Feb. 26, 1903	.128	.132	12,450	
	Sandy Hook Light	Ebb	Feb. 26, 1903	.052	.104	14,700	
	Opposite Sandy Hook Light	Flood	Feb. 27, 1903	.072	.108	15,300	
	Average			.129	.143		

872 The latter part of the table is the work of the commission on an additional Water Supply, the work having been done at Mount Prospect Laboratory, under my general supervision, but not personally performed by me.

Q. But all the work appearing in that table was done in Mount Prospect Laboratories, is that right?

A. Yes, sir.

Q. And the first three samples you yourself personally did, is that right?

A. Yes, sir.

Q. Now, taking the first three samples by their map numbers, 1, 4, and 7, where were they collected?

A. Sample No. 1 was collected off Pier 1 in the North River. Sample No. 4 was collected in the middle of the Narrows and Sample No. 7 at the Coney Island—what is known as the Iron Pier.

Q. By whom were they collected?

A. By me personally and examined by me.

They represent the amount of free and albuminoid ammonia, and the amount of chlorine obtained or to be found in the waters at these points.

Q. What object did you have in examining for free ammonia, for albuminoid ammonia and for chlorine?

A. The determination of free and albuminoid ammonia gives an indication of the amount of organic matter present in the water in its various stages. The albuminoid ammonia represents the coloring matter or living or dead organic growth. The free ammonia represents the product of the decomposition of such matter. The chlorine represents the degree of salinity of these waters. The salt water is usually about 18,000 parts per million of chlorine, whereas the water of Pier 1 was found to contain about one
873 third that amount. And at the Narrows less than one half that amount. That shows in a way the dilution which the waters going into the Bay are getting from the salt waters coming in at the Narrows and through the East River.

Q. And is that a factor to be considered in dealing with questions of sewage dilution and sewage digestion?

A. It is. The degree of dilution which the sewage gets is an indication of the amount of a nuisance which may be expected, or the liability of nuisance which may be expected at the present time or in the future.

Q. Who plotted those first samples?

A. I plotted them on a similar map to this, and transmitted them to Dr. Soper together with the analyses.

Q. There is a date given in the fourth column. Was that the date of the collection of the samples or the date of the report?

A. Those are the dates of the collection of the samples.

Q. Have you compared the results as they appear in that table with the original notes made by you after the examination?

A. I have, and they are entirely correct.

Q. I direct your attention to Table No. 8, as it appears on page

60 of Complainants' Exhibit No. 2, Dr. Jackson, and ask you who collected the samples that appear in the tabulated form in that table?

A. These samples were Collected by employees of the commission of additional Water Supply, and were examined by the Mount Prospect Laboratory or at the Poughkeepsie Laboratory, which was then in operation. They represent the amount of organic matter to be found at different points in the Hudson between Newburg and Kingston.

874 Q. But you did not make the collections?

A. No, sir.

Q. That last was Table No. 8A?

A. 8A.

Q. I now direct your attention, Doctor to Table No. 8B appearing on page 62 of Complainants' Exhibit No. 2, and ask who collected the samples that are tabulated in that table?

A. Those were also collected by the commission on additional water supply for New York City.

Q. But not by you?

A. But not by me personally. They were obtained chiefly for the purpose of getting the salinity of the river at that time.

Q. What do you mean by the term "salinity" Doctor?

A. The amount of common salt present.

Q. Which would indicate the source of the water as being where?

A. The sea.

Q. Doctor, coming to Table No. 9, appearing on page 62 of Complainants' Exhibit No. 2. I ask you who collected the samples that are tabulated in that table?

A. Table No. 9 was collected an- examined by me personally, and represents the proportions of salt and fresh water found along the shores of Staten Island and in the Lower New York Bay. Samples were also collected beginning with the one at Stapleton Dock and proceeding towards Tottenville, from 1 P. M. to 5:40 P. M. on October 22nd, 1904. The first column of figures represent the amount of chlorine in the water. The second column represents the percentage of sea water as determined from the chlorine figure in the first column using 18,900 as the normal amount of chlorine in the sea water. It showed that off Tottenville at that time the percentage of sea water was only 19. And between Ward's Point

COMPLAINANTS' EXHIBIT No. 2.

Table No. 8A, Page 60.

(As printed.)

Point of collection of sample.	Tide.	Free ammonia.	Albuminoid ammonia.
Newburg	High	.019	.126
Newburg	Low	.024	.140
Poughkeepsie	High	.022	.126
Poughkeepsie	Low	.19	.149
Hyde Park	High	.024	.133
Hyde Park	Low	.036	.153
Kingston	High	.029	.131
Kingston	Low	.029	.149
Average		.025	.138

COMPLAINANTS' EXHIBIT No. 2.

Table No. 8B, Page 62.

(As printed.)

Point of collection of sample.	Date.	Tide.	Chlorine.	Approximate per cent. of sea water.
Atlantic Ocean, 3 miles east of Sandy Hook Lightship	Feb. 27, 1903	Flood	16,250	90
Opposite Sandy Hook Light	Feb. 26, 1903	Ebb	14,700	82
Opposite Sandy Hook Light	Feb. 26, 1903	Flood	15,300	85
Rockaway Bell Buoy	Feb. 27, 1903	Flood	14,850	82
West Bank Light	Feb. 26, 1903	Ebb	12,450	69
Coney Island Pier	June 11, 1904	Ebb	18,180	100

Table No. 9, Page 62.

(As printed.)

Map No.	Point of collection of sample.	Chlorine.	Approximate per cent. of sea water.
50	Off Tottenville	3,400	19
49	Between Ward's Point and Tottenville	3,850	21
48	Off Ward's Point	5,600	31
47	Off Red Bank	13,000	72
44	Princess Bay	13,450	75
43	Seguine's Point	13,300	74
42	Latourette Point	13,900	77
41	South of Great Kills	13,150	73
40	Great Kills inshore	13,500	75
39	Great Kills	13,700	76
38	Great Kills Point	13,750	76
37	Between Great Kills and Elm Tree Beacon	13,800	77
36	Off Elm Tree Beacon	14,050	78
35	Off Midland Beach	14,000	78
34	Between Hoffman Island and South Beach	12,700	70
33	Narrows off Fort Wadsworth	12,050	67
32	Rosebank	12,350	68
31	Stapleton Dock	12,850	71

and Tottenville, 21. Off Ward's Point, 31. Off Red Bank
878 72 per cent. Off Princess Bay 75%. Off Sequine Point 74 per cent. Off Latourette Point 77 per cent. Off Great Kills 73 per cent. Great Kills in shore 75%. In the center of Great Kills 76%. Great Kills Point 76 per cent. Between Great Kills and Elm Tree Beacon 77 per cent. Off Elm Tree Beacon, 78 per cent. Off Midland Beach 78 per cent. Between Hoffman Island and South Beach 70 per cent. At the Narrows off Fort Wadsworth, 67 per cent. And at Rose Bank, 68 per cent. And at the Stapleton Dock 71 per cent.

Q. The locations that you have just described, Doctor, and indicated in the first column by map numbers. I would ask you who plotted these locations?

A. I plotted these locations on the map which was afterwards submitted to Doctor Soper and the locations were the ones which have been transcribed on this map in Exhibit No. 2.

Q. By this map meaning the one in Exhibit No. 2 and Exhibit No. 3?

A. No, it is in Exhibit No. 2. These samples were taken under the favorable conditions of flood tide, and show amount of salt water obtained at that time.

Q. And would you expect that to be—when you say favorable—a large amount or a small amount?

A. The amount of salt would be greater at the flood than at the ebb. The samples of chlorine were taken to get an idea of the amount of dilution which the harbor gets from the salt water.

Q. Did you make these chlorine determinations?

A. I did.

Q. Did you make them with a salinometer?

A. I collected them personally and examined them in the laboratory with silver nitrate, and the results were determined by
879 the most accurate process which could be had for that purpose. The salinometer is an instrument which determines the salinity easily and readily, but not with a great degree of accuracy, not with as great a degree of accuracy as the chemical results herein given.

Q. That is what I want to get, Doctor, these results I understand you to say were determined after chemical methods?

A. Yes, sir.

Q. And chemical reactions?

A. Yes, sir.

Q. Did you compare those items and results as they appear in Table No. 9, page 62 of Complainants' Exhibit No. 2 with your original notes?

A. I did, and they are entirely correct.

Q. In one part of your testimony, Doctor, you alluded to the first and second columns in which you state the chlorine and the approximate percentage of sea water is given. You meant the first and second columns in which the results are given?

A. I did.

Q. Which would be the third and fourth as they appear on the table?

A. Yes, sir.

Q. To whom did you report the results of these determinations as they appear in Table No. 9?

A. The results of those determinations were reported to Dr. Soper together with the location of the points which the samples were taaken.

Q. Did he first determine the points at which samples should be collected and direct you to obtain samples at these points?

A. Yes, sir.

Q. I direct your attention to Table No. 10, Doctor, appearing on page 63 of Complainants' Exhibit No. 2, and ask you who
880 collected the samples that are tabulated in that table and who made the determinations contained in the third and fourth columns of that table?

A. All of the samples in table No. 10 were collected and examined by me personally. This table is intended to represent the degree of salinity, or perhaps more properly speaking, the percentage of salt water in the waters of Gravesend Bay between Fort Hamilton and Sea Gate.

Q. When were the samples collected, Doctor?

A. The samples were collected between 1:45 P. M. and 3:45 P. M. October 20th, 1904.

Q. At what condition of the tide?

A. The tide was at flood and the amount of salinity would be at its highest at this time. The salinity in general runs between 70 and 77 per cent. only one sample is outside of those limits, sample No. 18, 100 feet south of Fort Hamilton. This sample has only 17 per cent. of sea water.

Q. State the point at which these samples were collected Doctor?

A. Sample No. 30, 500 feet north of Sea Gate. Sample No. 29—you will note that these numbers are not in consecutive order here. That was a re-arrangement, by Dr. Soper.

Sample No. 29, 200 feet north of Sea Gate. Sample No. 28, north of the pier of the Atlantic Yacht Club. I see these go backwards, these numbers.

Q. You had better follow the tabular form?

A. Sample No. 27 opposite Coney Island half way across the Bay. That is Gravesend Bay of course. Sample No. 26, opposite Coney Island 300 feet from shore. Sample No. 25, 75 feet off Public Camp Ground. Sample No. 24, New York Yacht Club, 100 feet off pier. Sample No. 23, Captains Pier, 100 feet off Beach. Sample No.

Table No. 10, Page 63.

(As printed.)

Map No.	Point of collection.	Chlorine.	Approximate per cent. of sea water.
30	500 Feet North of Sea Gate	12,800	71
29	200 Feet North of Sea Gate	12,600	70
28	North of Pier of Atlantic Y. C.	12,800	71
27	Opposite Coney Island half way across the Bay	12,800	71
26	Opposite Coney Island 300 feet from shore	12,750	71
25	75 feet off Public Camp Ground	12,950	72
24	N. Y. C. Club, 100 feet off pier	13,100	73
23	Captain's Pier, 150 feet off Beach	13,250	74
21	Off F. and M. Club, 20 ft. from raft	13,350	74
22	150 feet off Avoca Villa Pier	13,250	74
20	Fort Hamilton Beach, 100 feet south of East End	13,450	75
19	Fort Hamilton Beach, 100 feet from West End	13,800	77
18	Fort Hamilton, 100 feet south	12,800	17

882 No. 21, off Field and Marine Club, 20 feet from raft. Sample No. 22, 150 feet off Avoca Villa Pier. Sample No. 20, Fort Hamilton Beach, 100 feet south of the west end of Beach. Sample No. 19, Fort Hamilton Beach, 100 feet from the west end of beach Sample No. 18, Fort Hamilton, 100 feet south.

Q. Who plotted the locations at which the samples were obtained?

A. These locations were plotted by me at the time of the collection of the samples, and the plot submitted together with the analyses to Doctor Soper.

Q. Do they appear on the map that forms a part of Complainants' Exhibit No. 2?

A. They do.

Q. Does this table differ from the facts relating to this table that you submitted to Doctor Soper?

A. The figures have been compared with the original notes and are precisely the same.

Q. Not as to the arrangement?

A. The arrangement is revised.

Q. Will you explain what that means?

A. I presume Dr. Soper re-arranged it.

Q. That is not quite what I mean. You do not understand my question, Doctor, you say they were revised, what order did you put them in?

A. From 18 to 30.

Q. And they appear in the table from 30 to 18?

A. From 30 to 18.

Q. But they are the same locations, the same plottings with the exception of the order in which they appear?

A. Yes, sir.

Q. Now, Doctor, give your attention to Table No. 11, appearing on page 64 of Complainants' Exhibit No. 2, I ask you who collected the samples that are tabulated in that sample?

Table No. 11, Page 64.

(As printed.)

Map No.	Point of collection.	Date.	Tide.	Chlorine.	Approximate per cent of sea water.
	Narrows	Feb. 26, 1903	Ebb	11,950	66
	Narrows	Feb. 27, 1903	Flood	9,800	55
4	Narrows	June 11, 1904	Ebb	8,100	45
4	Narrows	June 11, 1904	Flood	9,800	55
13	Narrows	Oct. 17, 1904	Ebb	12,450	69
14	Narrows	Oct. 17, 1904	Ebb	12,260	68
15	Narrows	Oct. 17, 1904	Ebb	12,050	67
18	Narrows	Oct. 20, 1904	Flood	12,800	71
19	Narrows	Oct. 20, 1904	Flood	13,800	77
20	Narrows	Oct. 20, 1904	Flood	13,450	75
33	Narrows	Oct. 22, 1904	Flood	12,050	67
8	St. George, S. I.	Oct. 17, 1904	Flood	8,050	45
9	Tompkinsville	Oct. 17, 1904	Flood	9,200	51
10	Stapleton, S. I.	Oct. 17, 1904	Flood	8,600	48
31	Stapleton, S. I.	Oct. 22, 1904	Flood	12,850	71
11	Between Stapleton and Clifton	Oct. 17, 1904	Flood	8,750	48
12	Rosebank	Oct. 17, 1904	Flood	11,650	65
32	Rosebank	Oct. 22, 1904	Flood	12,350	69
2	South of Liberty Island	June 11, 1904	Flood	6,150	34
2	South of Liberty Island	June 11, 1904	Ebb	6,250	35
	Battery	Feb. 27, *0319*	Flood	8,150	45
	Battery	Feb. 26, 1903	Ebb	9,800	54
1	Pier No. 1, North River	June 11, 1904	Ebb	6,550	36

Table No. 11, Page 64.

(As corrected.)

Map No.	Point of collection.	Date.	Tide.	Chlorine.	Approximate per cent of sea water.
	Narrows	Feb. 26, 1903	Ebb	11,950	66
	Narrows	Feb. 27, 1903	Flood	9,800	55
4	Narrows	June 11, 1904	Ebb	8,100	45
4	Narrows	June 11, 1904	Flood	9,800	55
13	Narrows	Oct. 17, 1904	Ebb	12,450	69
14	Narrows	Oct. 17, 1904	Ebb	12,200	68
15	Narrows	Oct. 17, 1904	Ebb	12,050	67
18	Narrows	Oct. 20, 1904	Flood	12,800	71
19	Narrows	Oct. 20, 1904	Flood	13,800	77
20	Narrows	Oct. 20, 1904	Flood	13,450	75
33	Narrows	Oct. 22, 1904	Flood	12,050	67
8	St. George, S. I.	Oct. 17, 1904	Flood	8,050	45
9	Tompkinsville	Oct. 17, 1904	Flood	9,200	51
10	Stapleton, S. I.	Oct. 17, 1904	Flood	8,600	48
31	Stapleton, S. I.	Oct. 22, 1904	Flood	12,850	71
11	Between Stapleton and Clifton	Oct. 17, 1904	Flood	8,750	48
12	Rosebank	Oct. 17, 1904	Flood	11,650	65
32	Rosebank	Oct. 22, 1904	Flood	12,350	69
2	South of Liberty Island	June 11, 1904	Flood	6,150	34
2	South of Liberty Island	June 11, 1904	Ebb	6,250	35
	Battery	Feb. 27, 1903	Flood	8,150	45
	Battery	Feb. 26, 1903	Ebb	9,800	54
1	Pier No. 1, North River	June 11, 1904	Ebb	6,550	36

885 A. All of the samples which are numbered in that table—that is to say all except the first two, and the two preceding the last sample, were collected and examined by me personally.

Q. In order that it should appear a little clearer on the record, Doctor, state exactly by map numbers the samples that you collected and the points of collection?

A. The samples which I did not collect where four in number and are inserted merely to show the results which were obtained the year before, that is in the year 1903, as compared with those which I collected the following year.

Q. And were to that extent used as standards of comparison?

A. Yes, sir, or as figures for comparison.

Q. State the ones that you actually collected and the locations of the points at which you made the collections?

A. The two samples lab-led No. 4, one at the ebb and — at the flood tide were collected by me at the Narrows of June 11th, 1904, and show 45 per cent. of sea water at ebb tide and 55 per cent. of sea water at flood tide, an increase in salinity of 10 per cent. between the flood and the ebb. The samples numbers 13, 14, and 15 were collected on October 17th, 1904, all at ebb tide, and show a difference in salinity of only between 67 and 69 per cent. Samples Nos. 18 to 33 were collected by me on October 20th, and 22nd, at flood tide, and show a salinity between 67 and 77 per cent. taken on different days, all at the flood tide. The other samples in the table were taken at other points than the Narrows. Sample No. 8 at St. George, Staten Island, collected on October 17, shows a salinity of 45 per cent. No. 9 collected at Tompkinsville is 51 per cent of sea water. No. 10
886 collected at Stapleton is 71 per cent.

Q. On a different day?

A. These show probably different conditions of the tide at that point. That is different points in the flood tide. No. 11 collected between Stapleton and Clifton shows a percentage of sea water of 48 per cent. No. 12, collected at Rosebank shows 65 per cent. of sea water. No. 32, collected at Rosebank three days later, shows a percentage of salt water of 69.

No. 2, south of Liberty Island, collected June 11th shows 34 per cent. The second No. 2 collected on the ebb—by the way the results which have just been described were at the flood—the second number 2 in this tables shows the ebb tide as 35 per cent. as compared with the flood of 34 per cent. in the previous figure.

The sample No. 1, the last samples collected at Pier 1, June 11th, 1904, at the ebb tide shows a percentage of sea water of 36. The various comparisons at the different points show the relationship of the dilution of salt water, during the flood tide, and it will be noted that the figures show no material mixture with the salt water, as in the upper portion of the Bay. The degree of salinity becoming greater as the Lower Bay is reached.

Q. Do you know who made the examination of the other samples that are not plotted and contained in Table No. 11?

A. Contained in Table No. 11?

Q. Yes.

A. Those were made by the Commission of additional water supply at Mount Prospect Lab-ratory, and under my general supervision.

Q. Do you recall whether or not Mr. P. Schuyler Miller
887 was the one who made the determinations under your directions?

A. Mr. Miller was the man who made the examinations at that time.

Q. To whom did you report the results of the samples taken by yourself and submitted to analysis?

A. To Doctor Soper.

Q. In the chlorine column, Doctor, did you make the chlorine determinations by the salinometer or by chemical reactions?

A. By chemical reactions.

Q. And who did the plotting as indicated in this table No. 11, by map number?

A. The original plot was made by me and a map sent to Doctor Soper from which the map in Complainants' Exhibit No. 2 is copied.

Q. Did your mode of taking or making these samples differ in any respect, and if so, if it differed from the preceding method that you have described for the other tables?

A. No, sir. The examinations and collections were made in precisely the same manner as described for the previous tables.

Q. Did you take the same measure of precaution as to sterilization and transportation?

A. Precisely, except that samples taken for chlorine do not need to be sterilized.

Q. I am talking of the samples of water?

A. So far as they were sterilized, yes.

Q. I draw your attention to table No. 12, appearing on page 6 of Complainants' Exhibit No. 2, and ask you who took the samples that were tabulated in that table?

A. Those samples were taken by the commission on additional water supply and examined at Mount Prospect Lab-ratory under my general direction, by Mr. Miller.

COMPLAINANTS' EXHIBIT No. 2.

Table No. 12, Page 65.

(As printed.)

Point of collection of sample.	Chlorine.	Approximate per cent of sea water.
Narrows	7,862	43
Battery	2,767	15
Hudson at 130th Street	767	1
Hudson at Spuyten Duyvil	99.2	.5
Hudson at Alpine	21.3	.1
Hudson at Hastings	15.7	.08
East River at Brooklyn Bridge	7,435	41
East River at Blackwell's Island	9,958	55
East River at First Avenue	7,727	43
Harlem River at Spuyten Duyvil	433	24

COMPLAINANTS' EXHIBIT No. 2.

Table No. 13, Page 66.

(As printed.)

Point of collection.	Chlorine.	Approximate per cent of sea water.
Narrows	13,946	77
Battery	12,517	69
Hudson — Spuyten Duyvil	7,955	44
Hudson at Yonkers	6,283	35
Hudson at Hastings	5,041	28
Hudson at Croton Point	2,379	13
Hudson at Peekskill	1,108	6
East River at Brooklyn Bridge	12,646	70
Harlem River at 135th Street	11,958	66
Harlem River at Spuyten Duyvil	8,247	46

890 Q. Mr. Schuyler Miller is it?

A. Mr. P. Schuyler Miller.

Q. I direct your attention to Table No. 13, appearing on page 66 of Complainants' Exhibit No. 2, and ask who took the samples that are there tabulated?

A. Th-t represents samples taken by the commission on additional water supply, some of which may have been examined at the Poughkeepsie Laboratory all of which were under the general direction of the Mount Prospect Lab-ratory. At the time that the Poughkeepsie — was built it was intended to examine samples there at that point, in a branch lab-ratory, simply as matter of convenience.

Q. Was the Poughkeepsie Lab-ratory a branch of the Mount Prospect Lab-ratory?

A. It was.

Q. But, under the general direction?

A. Yes, sir, a temporary lab-ratory build for the use of the commission on addition- water supply during their investigations.

Q. Was Mr. Miller connected with the Mount Prospect or Poughkeepsie branch?

A. The Mount Prospect.

Q. Did you compare the tables Nos. 13 and 12, that I have directed your attention to, with any original notes that you have in the Mount Prospect Lab-ratory?

A. No, sir.

Q. Look at page 74 of Complainants' Exhibit No. 2, Doctor. I ask if you had anything to do in relation to that table as to fish, as to piscato*to*rial work?

A. No, sir, those are not analyses.

Q. Are there any other tables of Complainants' Exhibit No. 2 that you had anything to do with?

A. I think not.

Q. Doctor, I direct your attention to page 14 of Complainants' Exhibit No. 3 that you now hold in your hand, being table No. 1 on page 14 of Complainants' Exhibit No. 3, and I ask who collected the samples that are plotted by map numbers in that table?

COMPLAINANTS' EXHIBIT No. 3.

Table No. 1, Page 14.

(As printed.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Bacteric per c. c.	Tests for B. Coli. 0.1 c. c.	1.0 c. c.	10 c. c.
		a. m.					
51	Narrows opposite Fort Hamilton	10:00	5	1,200	x	x	x
52	Narrows opposite Fort Hamilton	10:10	40	270	x	x	x
53	Narrows opposite Fort Hamilton	10:15	80	90	x	x	x
54	¾ mile north Robbins Reef	10:53	5	1,730	x	x	x
55	¾ mile north Robbins Reef	11:15	40	400	x	0	x
56	¾ mile north Robbins Reef	10:58	80	260	0	0	0
		p. m.					
57	Off Battery and Governor's Island Midstream	2:40	at surface	3,330	0	x	x
58	Off Battery and Governor's Island midstream	2:30	5	1,540	x	x	x
59	Off Battery and Governor's Island midstream	2:35	20	1,180	x	x	x
60	Off Battery and Governor's Island midstream	2:22	40	730	x	x	x
61	Off Battery and Governor's Island midstream	2:38	60	560	0	0	0
62	Off Battery and Governor's Island midstream	2:15	80	460	x	x	x
63	¾ mile north Robbins Reef	3:05	5	2,160	x	x	x
64	¾ mile north Robbins Reef	3:57	40	380	x	x	x
65	¾ mile north Robbins Reef	2:45	80	260	x	x	x
66	Narrows	3:21	5	1,090	x	x	x
67	Narrows	3:24	40	810	0	x	x
68	Narrows	3:30	80	970	x	x	x

Table No. 1, Page 14.

(As corrected.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Bacteric per c. c.	Tests for B. Coli. 0.1 c. c.	1.0 c. c.	10 c. c.
		a. m.					
51	Narrows opposite Fort Hamilton	10:09	5	1,200	x	x	x
52	Narrows opposite Fort Hamilton	10:10	40	270	x	x	x
53	Narrows opposite Fort Hamilton	10:15	80	90	x	x	x
54	¾ mile north Robbins Reef	10:53	5	1,730	x	x	x
55	¾ mile north Robbins Reef	11:15	40	400	0	x	x
56	¾ mile north Robbins Reef	10:58	80	260	0	0	0
		p. m.					
57	Off Battery and Governor's Island Midstream	2:40	at surface	3,330	0	x	x
58	Off Battery and Governor's Island midstream	2:30	5	1,540	x	x	x
59	Off Battery and Governor's Island midstream	2:35	20	1,180	x	x	x
60	Off Battery and Governor's Island midstream	2:22	40	730	x	x	x
61	Off Battery and Governor's Island midstream	2:38	60	560	0	0	0
62	Off Battery and Governor's Island midstream	2:15	80	460	x	x	x
63	¾ mile north Robbins Reef	3:05	5	2,160	x	x	x
64	¾ mile north Robbins Reef	3:57	40	380	x	x	x
65	¾ mile north Robbins Reef	2:45	80	260	x	x	x
66	Narrows	3:21	5	1,090	x	x	x
67	Narrows	3:24	40	810	0	x	x
68	Narrows	3:30	80	970	x	x	x

A. All of those samples were collected by me and examined
893 by me personally.

Q. When did you make the collection, Doctor?

A. The samples were collected from a boat on January 28th, 1906, between 10 A. M. and 3:30 P. M.

Q. Where were those samples collected that are set forth in table No. 1, on page 14 of Complainants' Exhibit No. 3?

A. Those samples were taken from various points and at different depths in Upper New York Bay. The depth chosen between 5 feet 40 feet and 80 feet from the surface. The first three samples represent the water at the Narrows opposite Fort Hamilton and where numbered 51 to 53 and were taken between 10 A. M. and 10:15 A. M. on January 28th, 1906. These samples were collected in sterilized bottles and examined according to standard methods, with the following results: At five feet, 1200 bacteria positive results in all three dilutions for intestinal organisms.

Q. Might I suggest when you say 1200 bacteria that you indicate per what?

A. Per cubic centimeter. At 40 feet the bacteric were reduced to 270, and the intestinal organisms were present in all three dilutions. At 80 feet the bacteria were 90 and again intestinal organisms were present in all three dilutions. It will be noted that these samples were taken on January 28th, at the coldest period of the year and the bacterial results are therefore relatively lower at that point, so that at this season the tests for intestinal bacteria, which are not naturally affected by the cold are more indicative of actual contamination.

Q. To what degree?

A. During the summer time the bacteria grow to greater numbers, due to the temperature of the water at that time.

894 Q. And was this a high or a low degree of temperature for that period of the year?

A. This series of samples were taken usually on very cold days, there was ofter ice in the water at the time.

Q. What I am struggling to express, Doctor, is this: Do the conditions that you found during this cold weather in your bacterial determinations, and those for B. Coli indicate a high or low degree of pollution.

A. As I explained before the bacteria themselves at this period of the year are always lower than would be indicated by the degree of pollution, but tests for B. Coli which are not materially affected, even when caught in the ice—they are very extensive in these samples and indicate a high degree of pollution.

Q. Samples 54, 55 and 56?

A. Samples 54, 55 and 56 were taken three quarters of a mile north of Robins' Reef between 10:15 a. m.——

Q. You had better give the time for each sample?

A. Sample No. 54 was taken at 10:53 A. M. at a depth of five feet, and it gave a bacteria of 1730.

Q. Per what?

A. Per cubic centimeter, and positive tests for intestinal germs in all three dilutions.

Sample No. 55, taken at 11.15 A. M. at a depth of 40 feet, gave 400 bacteria and positive results in the one cubic centimeter and in the ten cubic centimeter dilutions.

Sample No. 56, taken at 10:58 at 80 feet depth, gave a bacteria of 260 and no tests for intestinal organisms. These results show a greater degree of pollution at the surface than at the 80 foot depth. That is probably due to the difference in specific gravity be-
895 tween sewage and salt water.

Q. Which has the greatest specific gravity?

A. Salt water has a much greater specific gravity, due to the salts which it contains in solution as well as to the low temperature which it almost always has.

Q. Would that cause sewage which is largely fresh water to come to the surface, even if discharged at any depth?

A. It would.

Q. In salt water?

A. Yes, sir. Sewage so discharged usually rises very quickly to the surface, and flows out over the top of the surface. That naturally does not give the same degree of dilution it would give if it were being discharged into fresh water.

Q. Doctor, you are a chemist. Does not salt water act as a precipatant in fresh water sewage?

A. It does to some extent, to quite an extent. The change from fresh to salt water in the sewage would tend to precipitate the albuminous material present.

Q. What inferences do you draw from the fact that the salt water shows a very high degree of salinity, as to the discharge of sewage into such water. It is already saturated with saline matter. What effect would that have on the sewage as to distribution and diffusion?

A. The sewage itself has a comparatively small amount of saline material, somewhat about say 60 parts per million as compared with 18,000 parts per million in salt water. So that it may be considered as practically fresh water.

Q. There is a great deal of organic matter in sewage that is in suspension, is there not?

A. Yes, sir, considerable amount in solution, considerable also in suspension.

896 Q. If such sewage is admixed with highly impregnated saline water, what would be the result in your experience?

A. Part of the organic matters, albuminous material present will be precipitated.

Q. Are those precipitants described as "sludge" later on?

A. Yes, sir.

Q. Well, proceed with this table, taking samples 57, 58 and 59?

A. Samples 57, 58, 59, 60, 61, and 62 are all taken at the same point and at different depths off the Battery and Governor's Island. That is between the Battery and Governor's Island.

Q. And as to the time of taking these samples?

A. Sample No. 57 was taken at 2:40 P. M. at the surface, contained *at* 3330 bacteria and coli in the one tenth and ten cubic centimeter dilution.

Samples No. 58, taken at 2:30 and at a depth of 5 feet gave 1540 bacteria and coli in all three dilutions used.

Sample No. 59, taken at 2:35 at a depth of 30 feet contained 1180 bacteria and coli in all three dilutions.

Sample No. 60, taken at 2:22, at a depth of 40 feet contained 730 bacteria, and again coli in all three dilutions.

Sample No. 61 taken at a depth of 60 feet contained 560 bacteria and no coli, bacteria, and no coli.

Sample No. 62, at a depth of 80 feet contained 460 bacteria and coli in all three dilutions.

These samples show or the figures obtained from these analyses show that the bacteria decreased from the surface downward as would be expected from the fact that the sewage is more concentrated at the surface. That the coli except in the 60 foot depth were there in very material amounts. At 60 feet there ap-
897 peared to be no indication of coli at that particular point.

Q. When you say the sewage was at the surface——

Mr. Riker: Concentrated was what he said.

Q. Do you wish to be understood as stating that these bacteria go where the organic matter is?

A. The bacteria in general, in that way.

Mr. Riker: I object to the form of the question, it is leading and improper.

The Commissioner: Note the objection.

The Witness: The bacteria are usually in numbers in proportion to the amount of organic matter present, provided the conditions for their growth are favorable. There relative numbers are indicated by the amount of organic matter present, even in unfavorable conditions for growth such as these are at this season of the year.

Q. The samples that you have just described, Doctor, were they collected also on January 28th, 1906?

A. They were.

Q. Is that a favorable or an unfavorable period of the year for the multiplication of bacteria and organic matter?

A. Unfavorable. The number of bacteria would be relatively lower at that season of the year than in the summer time due to the difference in temperature.

Q. Now the samples, 63, 64 amd 65 taken at Robbins Reef, Doctor?

A. Samples numbers 63, 64 and 65 were taken from three quarters of a mile north of Robbins Reef. Samples No. 63 collected at 3:05 P. M. at a depth of 5 feet showed a bacteria of 2,160 with coli in all three dilutions employed.

Sample No. 64 taken at 3:57 P. M. at a depth of 40 feet
898 showed 380 bacteria and coli in all three dilutions employed.

Sample No. 65, taken at 2:45 P. M. at a depth of 80

feet showed a bacterial content of 260 with coli in all three dilutions.

Samples Nos. 66, 67 and 68 were taken at the Narrows at varying depths.

Sample No. 66, taken at 3:21 P. M. at a depth of 5 feet gave a bacterial contents of 1090, and coli in all three dilutions.

Sample No. 67, taken at 3:24 P. M. at a depth of 40 feet, gave a bacterial contents of 810, with coli in the one centimeter and ten centimeter dilution.

Sample No. 68 taken at a depth of 80 feet, at 3:30 P. M. at a depth of 80 feet contained 970 bacteria, with coli in all three dilutions.

These latter results show coli in every sample planted, in all the three dilutions planted, except in the one tenth on number 67. These results show also a material pollution with intestinal germs, and the B. Coli results may be taken as more important than those of the bacteria as previously described in the other analyses of this table, for the reason that the B. Coli do not multiply to any extent and present the actual pollution as it was discharged into the water, whereas the bacterial results represent the relative amount of organic matter together with the—or at least their numbers being dependent to a certain extent upon the temperature of the water.

Q. Do you regard the B. Coli as parasitic or saprophitic?

A. Under some circumstances it is parasitic. It is in
899 the intestinal contents of the warm blooded animal. It represents a growth known as the B. coli group, and is contained in the fetal matter of warm blooded animals. It may be pathogenic if it gets into the blood.

Q. Who plotted these samples that are tabulated on page 14 of Complainants' Exhibit No. 3, and indicated as table No. 1 on that Exhibit?

A. Those points were plotted by me on a map at the time of the collection of the samples, the plots being submitted to Doctor Soper together with the analyses.

Q. Have you compared that table as it appears on page 14 of Complainants' Exhibit No. 3, with your original notes?

A. I have, and there is no difference except in No. 55, the sixth and seventh columns. The 7th column containing zero should be plus, and the sixth column contain plus should be zero.

Mr. Riker: I renew my objection to the use of this statement by the witness, it appearing by this witness' statement that this is a copy, that the original is in his possession, and I move that this testimony be s-ricken out, in so far as this is not based on original memoranda taken at the time.

The Commissioner: Note the objection.

Q. Who directed the locations from which these samples were taken, Doctor?

A. Doctor Soper.

Q. Did you report these various determinations that you have testified to in that table to him?

A. I did.

Q. I now direct your attention to table No. 2 appearing on page 14 of Complainants' Exhibit No. 3, and ask who secured the samples or who made the collection of samples that appear in
900 that tabulation?

A. Those samples were all collected and examined by me personally.

Q. When were the samples collected?

A. The results represent the bacterial analysis of water taken from various points at different depths in the Upper New York Bay. Samples were collected from a boat on January 30th, 1906 between 11 A. M. and 3:40 P. M.

At 4:30 P. M. Adjourned to meet again on November 24th 1911, at 10:30 A. M.

Table No. 2, Page 14.

(As printed.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Bacteria per c. c.	Tests for B. Coli. 0.1 c. c.	1.0 c. c.	10 c. c.
		a. m.					
69	Narrows opposite Fort Hamilton	11:12	5	220	x	x	x
70	Narrows opposite Fort Hamilton	11:05	40	390	0	x	x
71	Narrows opposite Fort Hamilton	11:00	80	350	x	x	x
		p. m.					
72	¾ mile north Robbins Reef	12:10	5	1,280	x	x	x
		m.					
73	¾ mile north Robbins Reef	12:00	40	1,055	x	x	x
		a. m.					
74	¾ mile north Robbins Reef	11:55	80	595	x	x	x
		p. m.					
75	Off Battery and Governor's Island, midstream	12:35	5	1,510	x	x	x
76	Off Battery and Governor's Island, midstream	12:30	40	920	0	x	x
77	Off Battery and Governor's Island, midstream	12:20	80	760	x	x	x
78	Off Battery and Governor's Island, midstream	3:15	5	1,200	x	x	x
79	Off Battery and Governor's Island, midstream	3:10	40	740	x	x	x
80	Off Battery and Governor's Island, midstream	3:00	80	540	0	x	x
81	¾ mile north Robbins Reef	3:40	5	930	0	x	x
82	¾ mile north Robbins Reef	3:32	40	750	0	x	x
83	¾ mile north Robbins Reef	3:26	80	420	0	0	x

902 Supreme Court of the United States, *November* Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK CITY,
November 24th, 1911—10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances:

Dr. William J. O'Sullivan, Special Counsel for the People of the State of New York.

Adrian Riker, Esq., of Counsel, for Passaic Valley Sewerage Commission, Defendants.

DANIEL D. JACKSON, a witness called on behalf of the complainants, recalled for further examination, testifies as follows:

Direct examination by Mr. O'Sullivan (resumed):

Q. Where were those samples, Doctor, that you just mentioned relative to Table No. 2 appearing on page 14 of Complainants' Exhibit No. 3, collected?

A. These samples were collected at various points at dif-
903 ferent depths in Upper New York Bay.

Q. Will you state the points that you collected the samples at?

A. Samples Nos. 69, 70 and 71 were collected at the Narrows opposite Fort Hamilton. Do you want me to go through those?

Q. Yes.

A. Sample No. 69 was collected at 11:12 A. M. at a depth of 5 feet, and gave a bacterial content of 220.

Q. Per what?

A. Per cubic centimeter, with positive tests, for intestinal germs, in all three dilutions taken.

Sample No. 70 was collected at 11:05 A. M. at a depth of 40 feet. The bacteria were 390 per cubic centimeter, and the Coli were positive in the one and the ten cubic centimeter dilutions.

Sample No. 71 was collected at 11 A. M. at a depth of 80 feet. The bacteria were 350 per cubic centimeter, with positive Coli tests in all three dilutions.

Samples Nos. 72, 73 and 74 were collected three quarters of a mile north of Robbins Reef.

Sample No. 72 was collected at 12:10 P. M. at a depth of 5 feet and the bacteria were found to be 1280 per cubic centimeter, with positive Coli tests in all three dilutions.

Sample No. 73 was collected at 12 M. at a depth of 40 feet and contained 1055 bacteria per cubic centimeter, with positive Coli tests in all three dilutions.

Sample No. 74 was collected at 11:55 A. M. at a depth of 80 feet and contained 595 bacteria per cubic centimeter, with positive Coli tests in all three dilutions.

Samples Nos. 75, 76, 77 and 78, 79 and 80 were collected off the Battery, between the Battery and Governors Island, mid stream.

Sample No. 75 was collected at 12:35 P. M. at a depth of 5 feet and contained 1510 bacteria with positive tests in all three dilutions.

Sample No. 76 was collected at 12:30 P. M. at a depth of 40 feet, and contained 920 bacteria, and Coli in the one and 10
904 cubic centimeter dilutions.

Sample No. 77, collected at 12:20 P. M. at a depth of 80 feet, contained 760 bacteria per cubic centimeter, and positive Coli tests in all three dilutions.

Sample No. 78, collected at 3:15 P. M. at a depth of 5 feet, contained 1200 bacteria per cubic centimeter, and positive Coli tests in all three dilutions.

Sample No. 79, collected at 3:10 P. M. at a depth of 40 feet contained 740 bacteria, with positive Coli tests in all three dilutions.

Sample No. 80 was collected at 3 P. M. at a depth of 80 feet with bacteria of 540 per cubic centimeter and positive Coli tests in the one and ten cubic centimeter dilution.

Samples Nos. 81, 82 and 83 were collected three quarters of a mile north of Robbins Reef.

Sample No. 81 collected at 3:40 P. M. at a depth of 5 feet contained 930 bacteria with Coli in the one and ten cubic centimeter dilution.

Sample No. 82 collected at 3:32 P. M. at a depth of 40 feet contained 750 bacteria and positive Coli tests in the one and ten cubic centimeter dilution.

Sample No. 83, collected at 3:26 P. M. at a depth of 80 feet contained 420 bacteria and positive Coli tests in the ten cubic centimeter dilution.

Q. Who made the bacterial count set forth in the table?

A. Those were made by me personally.

Q. And the bacterial count is predicated on the numbers in a cubic centimeter, is it?

A. Yes, sir.

Q. Who made the tests for the B. Coli?

A. Those were made also by me personally.

Q. To whom did you report the results of your determinations for both bacteria and B. Coli as set forth in Table No. 2 on
905 page 14 of Complainants' Exhibit No. 3?

A. Those results were all reported to Dr. Soper.

Q. Have you compared the items going to make up this table with your original notes?

A. I have, and they are entirely correct, corresponding entirely with the original figures.

Q. Taking the first three items Doctor, at Robbins Reef, with the map numbers 72, 73 and 74, what conclusions did you arrive at relative to the bacteria and Coli determinations?

A. These samples were taken at the flood tide, nearly at the end

of the flood, and represented about the highest dilutions which could be obtained in the Narrows. At the same time the pollution was very evident from the results of the B. Coli. In the case of the Robbins Reef results the time of collection was very close to flood tide and the same observation is true of those figures, except that the figures show very evidently a greater amount of pollution at that point as would naturally be expected. Off the Battery the pollution is also about the same, varying between top and bottom to some extent, and showing the relatively larger amount of sewage near the surface of the water, due, as would be expected to the difference in specific gravity, between the salt water and the sewage. Practically all of those figures bear out that conclusion. In the case of the results three quarters of a mile north of Robbins Reef—or, speaking of the Battery, the results taken at the Battery were taken partially at the flood and partially on the ebb of the tide.

Q. Which is which?

A. High water occurred at 12:05. The first three were on the flood and the last two were on the ebb.

Q. Indicate them by map numbers?

A. 75, 76 and 77 were at the flood, and 78, 79 and 80 at the ebb. These results show a decrease from top to bottom, but no very material difference between the flood and the ebb of the tide at that point. That is off the Battery and Governors Island.

906

Q. Were they about equally polluted, the samples?

A. Nearly so; there was a very slight difference. The flood seems to be slightly better.

Q. And at the flood how is it as to dilution?

A. The dilution would be greater at flood tide.

Q. Now, taking the second group of samples taken near Robbins Reef and indicated by the map numbers 81, 82 and 83, what do you say of those?

A. Those are compared with the samples 72, 73 and 74, above, which were taken at the flood tide. These latter three, 81, 82 and 83, being taken at the ebb tide and at that point, the bacterial results are somewhat higher at the ebb tide, the Coli figures being somewhat lower. In general the figures at this point show no very material difference between the flood and the ebb. The amount of pollution directly at this point, however, is not as great as in some other portions of the Harbor.

Q. Taking the map numbers set forth in Table No. 2, appearing on page 14 of Complainants' Exhibit No. 3, what are the locations at which these samples were taken?

A. The locations of these samples were plotted by me, on a map at the time that the samples were collected and of the results together with this map transmitted to Dr. Soper, who has described the locations on this general map.

Q. Where did you make the determinations for bacteria and for B. Coli as set forth in Table No. 2 that we have just been discussing?

A. These samples were collected and kept in ice and taken directly to Mount Prospect Laboratory where they were examined.

Q. By whom?

A. By me personally.

907 Q. Now, Doctor, let me direct your attention to Table No. 3, appearing on page 16 of Complainants' Exhibit No. 2 and ask who took the three samples that are tabulated in that table?

A. Those samples were collected and examined by me personally, and represent the condition of some of the tidal estuaries, Gowanus Canal being a representative estuary into which sewage is discharged. The sample No. 84, taken at the head of the canal, gave in parts per million, free ammonia 24.00, albuminoid ammonia, 5.40, chlorine 1400; bacteria 1,050,000. Tests for B. Coli positive in all three dilutions.

Sample No. 85, below Union Street, is about half way down to the Canal towards the Bay, contained 5.60 free ammonia; albuminoid ammonia 2.16; chlorine 5,900; bacteria per cubic centimeter 190,000. Coli in all three dilutions.

Sample No. 86, near the outlet of the Canal, contained 3.41 free ammonia, albuminoid ammonia, 1.26; chlorine 7450; bacteria per cubic centimeter, 100,000. B. Coli in all three dilutions. This represents the usual proportion of the Canal, represents a fairly strong sewage. The middle of the canal is diluted to a certain extent, but would represent a diluted sewage, a moderately diluted sewage. The outlet shows a slightly greater dilution, but still is about the strength of a mild sewage, so that the entire contents of the canal may be considered to be practically sewage.

Q. When did you collect these samples, Doctor?

A. These samples were collected on February 3, 1906, taken from a boat at a depth of 1 foot below the surface.

Q. By whom?

A. By me personally and examined by me personally, the results being plotted on a map and submitted together with the analyses to Dr. Soper.

Q. Where was the examination made to determine the bacterial count and the tests for the B. Coli?

A. Mount Prospect Laboratory.

908 COMPLAINANTS' EXHIBIT No. 3.

Table No. 3, Page 16.

(As printed.)

Map No.	Point of collection of sample.	Free ammonia.	Albuminoid onia.	Chlorine.	Bacteria per C. C.	Tests for B. Coli. 0.1 c. c.	1.0 c. c.	10 c. c.
84.	Head of Gowanus Canal.....	24.00	5.40	7,400	1,050,000	+	+	+
85.	Below Union Street.....	5.60	2.16	5,900	190,000	+	+	+
86.	Near Outlet.....	3.40	1.26	7,450	100,000	+	+	+

909 Q. By whom?

A. By me personally.

Q. Did you compare that table as set forth on page 16 of Complainants' Exhibit No. 3 with your original notes?

A. I did, and it is correct, and corresponds in every respect to the original notes. This examination of this canal represents in a somewhat exaggerated degree the condition of the slips on the Brooklyn water front, where the sewage is discharged at the bulkheads.

Q. Doctor, let me direct your attention to Table No. 4, appearing on page 17 of Complainants' Exhibit No. 3, and ask who collected the samples that are tabulated in that table?

A. The samples tabulated in Table No. 4, were collected by me personally and examined by me personally, and represent the results of bacterial analyses of water taken from various points at different depths in the Lower Bay and Narrows; this samples were collected from a boat on February 17th, 1906, between 2:45 P. M. and 4:40 P. M. Part of the samples were taken on the ebb and part on the flood tide.

Q. Indicate by the map number which was which, when you discuss them, Doctor.

A. High tide occurred at Sandy Hook at 2:39 P. M.

Q. P. M. or A. M.?

A. 2:39 P. M. so that all of these samples were taken on the flood of the tide—I will have to change that. Cut that original statement out.

Mr. Riker: I guess we better let it stand. If you want to correct it, why you can make the correction after.

Mr. O'Sullivan: Make the correction now, Doctor.

A. These samples were collected at the Narrows, and the only figures which we have to judge by are that the high tide at Sandy Hook is somewhat different.

910 Q. Does it differ from the high tide at Governors Island?

A. Very materially.

Q. As to what?

—. As to time, but the samples may be said to have all been collected on the flood of the tide—on the ebb of the tide.

Samples Nos. 87, 88 and 89 were collected off Norton's Point in the Lower Bay.

Sample No. 87 was collected at 3:30 P. M. at a depth of 5 feet and contained 1045 bacteria per cubic centimeter and Coli in one and ten cubic centimeter dilution.

Sample No. 88 was collected at 3 P. M. at a depth of 40 feet and contained——

Q. Where?

A. These are all off Norton's Point. At a depth of 40 feet and contained 560 bacteria per cubic centimeter and B. Coli in the ten cubic centimeter dilution.

Sample No. 89 was collected at 2:45 P. M. at a depth of 80 feet

and contained 225 bacteria per cubic centimeter and Coli in the the cubic centimeter dilution.

Samples Nos. 90, 91 and 92 collected at the Narrows.

Sample No. 90 was collected at 4:40 P. M. at a depth of 5 feet and contained 1180 bacteria per cubic centimeter and B. Coli in the one and ten cubic centimeters dilution.

Sample No. 91 was collected at 4:25 P. M. at a depth of 40 feet and contained 545 bacteria per cubic centemeter and B. Coli in the one and ten cubic centimeter dilution.

Sample No. 92 was collected at 4:10 P. M. at a depth of 80 feet and contained 460 bacteria per cubic centimeter and B. Coli in the one and ten cubic centimeter dilution.

These samples represent the Lower Bay and on the ebb of the tide. They show a considerable dilution at this point, and it will be noted from the B. Coli results they are considerably less than in the Upper Bay, as would be expected.

COMPLAINANTS' EXHIBIT No. 3.

Table No. 4, Page 17.

(As Printed.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Bacteria Per C. C.	Tests for B. Coli. 0.7 C. C.	1.0 C. C.	10 C. C.
		p. m.					
87.	Off Norton's Point, Lower Bay	3:30	5	1,045	0	+	+
88.	Off Norton's Point, Lower Bay	3:00	40	560	0	0	+
89.	Off Norton's Point, Lower Bay	2:45	80	225	0	0	+
90.	Narrows	4:40	5	1,180	0	+	+
91.	Narrows	4:25	40	545	0	+	+
92.	Narrows	4:10	80	460	0	+	+

912 Q. What do they indicate comparing the samples taken at the different depths of water?

A. At the different depths they show that the polluting material is still at the surface, or at least to a greater degree at the surface than at a depth, and the bacteria and to some extent the B. Coli show a diminution between the 5 and the 80 foot depths.

Q. When you collected these samples what did you do with them?

A. These samples were collected and taken in ice to Mount Prospect Laboratory.

Q. Who made the bacterial count in the tests for B. Coli?

A. Both the results for bacteria and those for B. Coli were made by me personally, and the results were—and the points at which the samples were taken were jotted on the original map at the time of collection, and this was sent together with the analyses to Dr. Soper.

Q. Have you compared that table No. 4 at page 17 of Complainants' Exhibit No. 3, with your original notes?

A. I have and it corresponds in every respect.

Q. Doctor, let me direct your attention to Table No. 5, appearing on page 18 of Complainants' Exhibit No. 3 and ask by whom the samples tabulated in that table were collected?

A. The samples on Table No. 5 were collected and examined by me personally.

Q. When?

A. The results represent the bacterial analyses of water taken from various points in the Upper Bay and lower ends of the East and North Rivers. The samples were collected from a boat on March 2nd, 1906, between 11 A. M. and 5:15 P. M.

Q. Where did you collect these samples, giving the map number to indicate the locations?

A. Sample No. 93 was collected off Bath Beach, Brooklyn, at 11 A. M. and contained 4,100 bacteria per cubic centimeter with positive Coli tests in all three dilutions.

913 Sample No. 94 was collected at the head of the Lower Bay off Fort Wadsworth in the Narrows at 11:10 A. M. and contained 3380 bacteria and positive B. Coli tests in all three dilutions.

Sample No. 95 was collected off Clifton, Staten Island, in midstream at 11:15 A. M. and contained 3100 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 96 was collected off Tompkinsville, Staten Island at 11:25 A. M. and contained 3580 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 97 was collected at the west end of the Kill von Kull at 11:35 A. M. and contained 4670 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 98 collected off New Brighton, Staten Island, Kill von Kull at 11:45 contained 3500 bacteria per cubic centimeter and positive B. Coli tests in the one and ten cubic centimeter dilution.

Sample No. 99, collected at the Kill von Kull off Sailors' Snug Harbor, Staten Island, collected at 12 M. contained 3800 bacteria per cubic centimeter and positive Coli tests in the one and ten cubic centimeter dilutions.

Sample No. 100 collected at the Kill von Kull off Port Richmond, Staten Island, at 12:10 P. M. contained 4900 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 101, collected northwest of Robbins Reef Light at 1:45 P. M. contained 3250 bacteria and positive B. Coli tests in all three dilutions.

Sample No. 102 collected northeast of Robbins Reef Light, collected at 1:50 P. M. contained 3680 bacteria per cubic centimeter and positive B. Coli tests in one and ten cubic centimeter dilutions.

Table No. 5, Page 18.

(As printed.)

Map No.	Point of collection of sample.	Time.	Bacteria per c. c.	Tests for B. Coli. 0.1 c. c.	1.0 c. c.	10 c. c.
		a. m.				
93	Off Bath Beach, Brooklyn	11:00	4,100	x	x	x
94	Head of Lower Bay, off Fort Wadsworth Narrows	11:10	3,380	x	x	x
95	Off Clifton, Staten Island, mid-stream	11:15	3,100	x	x	x
96	Off Tompkinsville, Staten Island	11:25	3,580	x	x	x
97	West end of Kill von Kull	11:35	4,670	x	x	x
98	Off New Brighton, Staten Island, Kill von Kull	11:45	3,500	0	x	x
		m.				
99	Kill von Kull, off Sailors' Snug Harbor, Staten Island	12:00	3,800	0	x	x
		p. m.				
100	Kill von Kull, off Port Richmond, Staten Island	12:10	4,900	x	x	x
101	Northwest Robbins Reef Light	1:45	3,250	x	x	x
102	Northeast Robbins Reef Light	1:50	3,680	0	x	x
103	Midway between Robbins Reef and Liberty Island	1:55	3,200	x	x	x
104	Southwest of Liberty Island	1:57	5,910	x	x	x
105	Between Liberty Island and Claremont, New Jersey	2:00	6,800	x	x	x
106	Between Ellis Island and Liberty Island	2:05	5,120	0	x	x
107	Off Ellis Island	2:12	8,050	x	x	x
108	Northeast of Ellis Island	2:15	7,060	x	x	x
109	Off Central R. R. of N. J. Docks, N. J.	2:20	7,480	x	x	x
110	Off Penn. R. R. Docks, N. J.	2:30	5,100	x	x	x
111	Off Erie R. R. Docks, N. J.	2:45	5,350	x	x	x
112	Off D., L. & W. R. R. Docks, N. J.	2:55	4,300	0	x	x
113	North of Hoboken, N. J.	3:10	3,560	0	x	x
114	Off Weehawken, N. J.	3:25	3,120	0	x	x
115	Off American Line Dock, mid-stream	3:35	5,410	x	x	x
116	Off Pier No. 4, North River, Manhattan	3:40	5,780	x	x	x
117	Off Battery, Manhattan	3:38	7,280	x	x	x
118	Off Pier No. 6, East River, Manhattan	3:45	14,100	x	x	x
119	Off Pier No. 13, East River, Manhattan	3:55	18,400	x	x	x

120	Off Pier No. 20, East River, Manhattan	3:58	12,000	x	x	x
121	Off Pier No. 28, East River, Manhattan	4:00	15,300	x	x	x
122	Off Pier No. 23, East River, Brooklyn	4:05	4,300	0	0	x
123	Off Atlantic Docks, Buttermilk Channel, Brooklyn	4:15	10,400	x	x	x
124	Off Beards, Erie Basin, Brooklyn	4:20	36,800	x	x	x
125	Off Gowanus Bay, Brooklyn	4:25	8,500	x	x	x
126	Off Gowanus and Hamilton Ave. Bridge, Brooklyn	4:35	270,000	x	x	x
127	Between Hamilton Ave. Bridge and outlet, Brooklyn	4:40	180,000	x	x	x
128	Off Prince Line Dock, Brooklyn	4:50	24,300	x	x	x
129	Off 56th street, Brooklyn	5:00	16,400	x	x	x
130	Off 65th street, near sewer, Brooklyn	5:05	278,000	x	x	x
131	Off Crescent Club, Brooklyn	5:15	5,800	0	x	x
132	At Oyster beds, mouth of Bodine Creek, Port Richmond	12:35	11,200	x	x	x
133	Bodine Creek, midway to bend at crossing	12:30	11,500	x	x	x
134	Bodine Creek, upper end	12:25	15,800	x	x	x
135	Rahway River, below sewer outlet	12:30	8,500	x	x	x
136	Rahway River, N. J., over oyster beds	2:15	5,800	x	x	x

Sample No. 103, midway between Robbins Reef and Lib-
915 erty Island, collected at 1:55 P. M. contained 3200 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 104, southwest of Liberty Island, collected at 1:57 P. M. contained 5910 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 105, collected between Liberty Island and Claremont, New Jersey, collected at 2 P. M. contained 6800 bacteria, per cubic centimeter, and positive B. Coli tests in all three dilutions.

Sample No. 106, between Ellis Island and Liberty Island, collected at 2:05 P. M. contained 5120 bacteria per cubic centimeter and positive B. Coli tests in the one and ten cubic centimeter dilutions.

Sample No. 107, collected off Ellis Island, at 2:12 P. M. contained 8650 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 108, collected northeast of Ellis Island, collected at 2:15 P. M. contained 7,060 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 109, collected off Central Railway of New Jersey Docks in New Jersey, collected at 2:20 P. M. contained 7480 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 110, collected off the Pennsylvania Railway Docks in New Jersey, collected at 2:30 P. M. contained 5100 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 111, collected off the Erie Railway Docks in New Jersey, collected at 2:45 P. M. contained 5350 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 112, collected off the Delaware, Lackawanna & West-
916 ern Railway Company docks in New Jersey, collected at 2:55 P. M. contained 4300 bacteria and positive B. Coli tests in the one and ten cubic centimeter dilutions.

Sample No. 113, collected north of Hoboken, New Jersey, collected at 3:10 P. M. contained 3560 bacteria, and positive B. Coli tests in the one and ten cubic centimeter dilutions.

Sample No. 114, collected off Weehawken, New Jersey, at 3:25 P. M. contained 3120 bacteria per cubic centimeter and positive B. Coli tests in the one and ten cubic centimeter dilutions.

Sample No. 115, collected off the American Line Dock in mid stream at 3:35 P. M. contained 5410 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 116, collected off Pier No. 4 North River, Manhattan, collected at 3:40 P. M. contained 5780 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 117, collected off the Battery Manhattan at 3:38 P. M. contained 7280 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 118, collected off Pier No. 6, East River Manhattan

at 3:45 P. M. contained 14100 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 119, collected off Pier No. 13 East River Manhattan, at 3:55 P. M. contained 18400 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 120, collected off Pier No. 20 East River Manhattan, at 3:58 P. M. contained 12,600 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 121, collected off Pier No. 28 East River Manhattan at 4 P. M. contained 15300 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 122, collected off Pier No. 23 East River Man-
917 hattan at 4:05 P. M. contained 4300 bacteria per cubic centimeter and positive B. Coli tests in the ten cubic centimeter dilution.

Sample No. 123, collected off Atlantic Docks, Buttermilk Channel, Brooklyn, collected at 4:15 P. M. contained 10,400 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 124, collected off Beard's Erie Basin, Brooklyn, at 4:20 P. M. contained 36,800 bacteria per cubic centimeter, and positive B. Coli tests in all three dilutions.

Sample No. 125 collected off Gowanus Bay, Brooklyn, collected at 4:25 P. M. contained 8500 bacteria per cubic centimeter, and positive B. Coli tests in all three dilutions.

Sample No. 126, collected off Gowanus and Hamilton Avenue Bridge, Brooklyn, collected at 4:35 P. M. contained 270,000 bacteria per cubic centimeter, and positive B. Coli tests in all three dilutions.

Sample No. 127 collected between Hamilton Avenue Bridge and the outlet Brooklyn,—that is the outlet of the Gowanus Canal, collected at 4:40 P. M. contained 180,000 bacteria per cubic centimeter, and positive B. Coli tests in all three dilutions.

Sample No. 128 collected off Prince Line Dock, Brooklyn, collected at 4:50 P. M. contained 24300 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 129, collected off 56th Street Brooklyn, 5 P. M. contained 11,200 bacteria per cubic centimeter and positive tests in tests in all three dilutions.

Sample No. 130, collected off 65th Street, near the sewer, near the 65th Street trunk line sewer Brooklyn, at 5:05 P. M. contained 278,000 bacteria per cubic centimeter, and positive B. Coli tests in all three dilutions.

Sample 131, collected off the Crescent Club of Brooklyn, at 5:15 P. M. contained 5800 bacteria per cubic centimeter, and positive B. Coli tests in the one and ten cubic centimeter dilutions.

918 Sample No. 132, collected at the oyster beds at the mouth of the Bodine Creek, Port Richmond, at 12:35 P. M. contained 11,200 bacteria per cubic centimeter and positive tests in all three dilutions.

Sample No. 133, collected at Bodine Creek, midway between the head of the mouth and at the crossing, collected at 12:30 P. M. con-

tained 11,500 bacteria per cubic centimeter and positive Coli tests in all three dilutions.

Sample No. 134, collected at the Upper end of Bodine Creek, collected at 12:25 P. M. contained 15,800 bacteria, per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 135, collected from the Rahway River, below the sewer outlet at 12:30 P. M. contained 8,500 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 136, collected from the Rahway River, New Jersey, over Oyster Beds at 2:15 P. M. contained 5800 bacteria per cubic centimeter and positive tests for B. Coli in all three dilutions.

Set of analyses represents the conditions in general in the Upper Bay, the samples being taken at a very large number of points about the Bay. It will be seen particularly off the Brooklyn Water front that the pollution is very great and that at those points in the Bay opposite the sewer outlets the contamination is very extensive, and that the results in general show very material pollution at the points indicated.

Q. Taking that item indicated in Table No. 5, page 18 of Complainants' Exhibit No. 3, indicated in the table by the map No. 132, at the oyster beds at the mouth of Bodine Creek, Port Richmond. What would you say of the bacteriological count and the tests for B. Coli as to the degree of pollution in that region, No. 132?

A. If these figures are now plotted in red on the map, the
919 sample taken at this point, is in the Kill von Kull in Newark Bay and the Upper Bay and represents the quality of the water at that point, together with some pollution which comes from Bodine Creek. At the mouth of this creek in the Kill von Kull, there are a large number of oyster rafts and the pollution at this point is such as to render the oysters unsafe for use, and since these analyses have — made, I was told that the Health Department has insisted on the drinking of oysters being discontinued at this point, on account of the gross contamination.

Mr. Riker: I object to that as hearsay evidence and move that it be stricken out as it is not responsive or an answer to a question which could be objected to.

The Commissioner: Note the objection.

The Witness: I might add that I was at this point within seeing distance of where the rafts were within a few months and was unable to discover that the cars were there. I feel practically certain they had been removed. I know they were to be immediately.

Q. In accordance with the advice you had from the Board of Health?

A. From the Board of Health, yes, sir.

Q. What inference in general do you draw from the bacteriological determinations and the tests for B. Coli as indicated in that Table No. 5?

A. That the waters of the Upper Bay are very materially polluted at all points, particularly on the Brooklyn shore and on the shores of Manhattan, to a lesser degree on the Jersey side.

Q. I understood you to say, Doctor, that you collected these samples yourself personally?

A. I did.

Q. And what did you do with the samples after they were collected?

920 A. Transported them personally to the laboratory personally, and examined them personally.

Q. Who made the bacterial count indicated in Table No. 5?

A. I made both the bacterial and B. Coli determinations personally.

Q. Have you compared Table No. 5 as it appears on Page 18 of Complainants' Exhibit No. 3 with your original notes?

A. I have and find it to be entirely correct.

Q. To whom did you report the results of these determinations and the locations from where the samples were secured?

A. These results together with the plate on the map of the location of the samples were transmitted to Dr. Soper.

Q. By whom?

A. By me.

Q. In what laboratory were the determinations made as indicated in that table?

A. Mount Prospect Laboratory Brooklyn.

Q. By what methods?

A. By the standard methods of the American Public Health Association. The method for B. Coli at this time was the one which has since been standardized from being accepted by that Association, at this time, it was not then accepted, the method having been devised at Mount Prospect Laboratory.

Q. By whom?

A. By me.

Q. And known in the profession as what?

A. The lactose peptone bile method, or the bile method for short.

Q. Known as the bile lactose method?

A. Sometimes so called. The solution contains lactose and peptone dissolved in ox-gall. That is the ox-gall of the normal strength found in the animal.

Mr. Riker: I move that the last testimony be stricken out as immaterial, and it has already once or twice been put in by this witness.

The Commissioner: Note the objection.

Q. Doctor, direct your attention to Table No. 6 appearing on page 20 of Complainants' Exhibit No. 3. I ask you by whom the
921 samples were collected that are indicated by map numbers in that table?

A. The samples were the samples in Table No. 6, they were collected by me personally and examined by me personally.

Q. When did you collect them?

A. On March 31st, 1906.

Q. What hours?

A. Between 3 and 4:30 P. M.

Q. How did you collect these samples?

A. The samples were collected from a boat, the results representing chemical and bacteriological analyses of water taken from various points in the Bronx River at a depth of 1 foot below the surface.

Q. Where was the sample indicated by the map No. 137 in Table 6 taken from?

A. Sample No. 137 was taken from the Bronx River below the dam, and contained free ammonia .300, albuminoid ammonia, .250, chlorine 50; bacteria 14,800 per cubic centimeter, and positive B. Coli tests in all three dilutions.

Sample No. 138, was collected from the Bronx River at the mouth, and contained .310 of free amonia; albuminoid ammonia, .340, chlorine 5200, bacteria per cubic centimeter 9,500, and positive B. Coli tests in all three dilutions.

Sample No. 139, was collected in the Bronx River between the mouth and Hunt's Point, and contained .250 of free ammonia, and .530 of albuminoid ammonia, and 6600 chlorine, and bacteria per cubic centimeter 7,200, with positive B. Coli tests for all three dilutions.

Sample No. 140, was collected from the Bronx River off Hunt's Point, and contained free ammonia .240; albuminoid ammonia, .260, and chlorine 13,500; bacteria 3,400; Coli in all three dilutions.

Q. Doctor, will you explain those chlorine figures as they appear in Table No. 6 on page 20 of Complainants' Exhibit No. 3?

A. The chlorine varies from 50 in the upper portion of the river to 13,500 near the mouth.

Q. 50 what?

922 A. 50 parts per million. This represents the dilution which the Bronx River gets with salt water at the various points. Samples 139 and 140 are practically in the East River. Sample 138 is practically at the outlet of the Bronx River, in the East River. The results show that the water coming from this point is very materially polluted with sewage. Both the bacteriological results and those for B. Coli show this to be a fact.

Q. What was your object in conducting tests for free ammonia and albuminoid ammonia?

Mr. Riker: I object to it as immaterial.

The Commissioner: Note the objection.

A. In order to determine the amount of organic matter, or at least to get an indication of the amount of organic matters present in this water, the ammonia representing the nitrogen of such organic matter.

Q. Who made the determinations that are indicated in Table No. 6 for free ammonia and albuminoid ammonia?

A. They were made by me personally.

Q. Who made the chlorine determinations in that test?

A. I did.

Q. Who made the bacterial count?

A. I made that personally.

Q. And who conducted the test for B. Coli indicated in the three last columns of that table?

A. I did.

Q. Have you compared that Table No. 6 on page No. 20 on Complainants' Exhibit No. 3, with the original notes of these determinations?

A. I have, and the results correspond in every respect.

Q. To whom did you report these results?

A. The results were reported to Dr. Soper, together with the plotting of the locations of the collection of these samples.

Q. What inferences did you draw from the results of the chemical determinations in bacterial counts and B. Coli tests, as they appear in Table No. 6?

923 A. That the contamination of the Bronx River and the East River at this point was very considerable in amount.

Q. I did not get what you said. What was it that was considerable?

A. The contamination, sewage contamination, if you will.

Q. Doctor, let me direct your attention to Table No. 7, which appears on Page No. 21 of Complainants' Exhibit No. 3 and ask who collected the samples indicated by Map numbers in that Table?

A. Those samples were collected and examined by me personally.

Q. When did you collect those samples?

A. On April 1st, 1906, and they represent the results of bacterial analyses of water taken from various points in the water surrounding Manhattan Island.

Q. Between what hours on April 1st, 1906?

A. Between 9.55 A. M. and 3.05 P. M. a boat was employed for the purpose and an entire circuit of Manhattan Island was made. Samples were collected about one foot below the surface.

Q. State, indicating by the map number where the various samples were collected by you, Doctor?

A. Sample No. 141 was collected from the Hudson River off Spuyten Duyvil at 12:42 P. M. and contained 3550 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Q. State whether they were positive or negative?

A. Positive B. Coli tests in all three dilutions.

Sample No. 142, collected from the Hudson River north of Fort Washington Point at 12:50 P. M. contained 2230 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 143 collected from the Hudson River south of Fort Washington Point at 1.05 P. M. contained 2310 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 144, collected from the Hudson River or Grant's Tomb near the bottom, at 1.15 P. M. contained 3210 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

924 Sample No. 145 collected in the Hudson River off Grant's Tomb at the surface contained 2,640 bacteria per cubic centimeter and positive tests in the one and ten cubic centimeter dilutions for B. Coli.

Sample No. 146, collected in the Hudson River off West 80th Street at 2.45 P. M. contained 2900 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 147, collected in the Hudson River off West 40th Street at 3.05 P. M. contained 4680 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 148, collected in the East River off the Battery at the bottom, collected at 9.55 A. M. contained 4280 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 149, collected in the East River or the Battery at the surface, at 10 A. M. contained 6,250 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 150, collected at the East River Pier No. 15 at 10:05 A. M. contained 4410 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 151, collected at the East River under Manhattan Bridge, collected at 10.10 A. M. contained 8460 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 152, collected at the East River below Blackwell's Island at the bottom, at 10 40 A. M. contained 8,320 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 153, collected at the East River below Blackwell's Island at the surface, collected at 10.45 A. M. contained 8940 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 154 collected from the East River below Blackwell's Island at 11.05 A. M. contained 9,120 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 155, collected from the East River off Ran-
925 dall's Island at 11.20 A. M. contained 8740 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 156, collected from the Harlem River at the first bridge at 11.30 A. M. contained 7200 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 157, collected from the Harlem River at the third bridge at 11.35 A. M. contained 3640 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 158, collected from the Harlem River at the fifth bridge, Madison Avenue, at 11.40 A. M. contained 3260 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 159, collected from the Harlem River at the southern bridge, collected at 11.45 A. M. contained 2970 bacteria per cubic centimeter and positive B. Coli tests in the one and ten cubic centimeter dilutions.

Sample No. 160 collected from the Harlem River, at Highbridge, near the bottom, at 11.50, contained 2760 bacteria per cubic centimeter and positive B. Coli tests in the ten cubic centimeter dilution.

Sample No. 161, collected from the Harlem River at Highbridge near the surface, at 11.55 A. M. contained 3530 bacteria per cubic centimeter and positive B. Coli tests in all three dilutions.

Sample No. 162, collected from the Harlem River above Washington Bridge, at 3.05 P. M. contained——

Q. When?

A. At 12.05 P. M. contained 3675 bacteria per cubic centimeter and positive B. Coli tests in the one and ten cubic centimeter dilutions.

Sample No. 163 collected from the Harlem River opposite New York University, at 12.15 P. M. contained 1680 bacteria per cubic centimeter and positive B. Coli test in the ten cubic centimeter dilution.

926 COMPLAINANTS' EXHIBIT No. 3.

Table No. 6, Page 20.

(As printed.)

Map No.	Point of collection of sample.	Free ammonia.	Albuminoid ammonia.	Chlorine.	Bacteria Per C. C.	Test for B. Coli. 0.1 c. c.	0.1 c. c.	10 c. c.
137.	Bronx River below dam.....	.300	.250	50	14,800	+	+	+
138.	Bronx River, at mouth.....	.310	.340	5,200	9,500	+	+	+
139.	Bronx River, between mouth and Hunts Point	.250	.530	6,600	7,200	+	+	+
140.	Bronx River off Hunts Point.....	.240	.260	13,500	3,400	+	+	+

927 Sample No. 164, collected from the Harlem River at Broadway Bridge at 12.25 P. M. contained 2400 bacteria per cubic centimeter and positive B. Coli tests in the one and ten cubic centimeter dilutions.

Sample No. 165, collected from the Harlem River at the bend of the river between the last two bridges at 12.35 P. M. contained 2310 bacteria per cubic centimeter and no Coli.

Sample No. 166, collected from the Harlem River at the New York Central Bridge just at the point where the Harlem enters the Hudson at 12.40 P. M. contained 2340 bacteria per cubic centimeter and no B. Coli.

Q. What did you do with the samples after collecting them, Doctor?

A. The samples were collected and kept in ice and transported to Mount Prospect Laboratory where they were examined by me personally.

Q. Who made the bacterial count as set forth in the fourth column of Table No. 7, page 21, Complainants' Exhibit No. 3?

A. I did.

Q. Who conducted the tests for B. Coli appearing in columns 5, 6, and 7 of Table No. 7 Complainants' Exhibit No. 3?

A. They were made by me also.

Q. What inferences did you draw from your examinations of these samples, Doctor?

A. This set of samples represents the condition of the water about Manhattan Island and show very material pollution, particularly at the lower portions of the Island in the North and East Rivers. The lower portion of the Harlem River is also materially polluted.

Q. Have you compared table No. 7 on page 21 of Complainants' Exhibit No. 3 with the original notes taken of these examinations and determinations?

A. I have, and on this exhibit are two corrections of printer's errors. On one sample, No. 154, where the bacteria has been corrected to read 9120 instead of 9130, and sample No. 164, where the positive tests for B. Coli in the one tenth cubic
928 centimeter has been changed to a negative test. In other respects the table is entirely correct and corresponds with the original notes.

Q. To whom did you report the results of your examinations?

A. These results were reported together with the plot of the points at which the various samples were collected, to Dr. Soper.

Q. In what laboratory did you conduct these examinations to determine the number of bacteria per cubic centimeter?

A. Mount Prospect Laboratory, Brooklyn.

Q. Did you also make the tests there for B. Coli that appear in Table No. 7?

A. Yes, sir.

Q. Who did the plotting of these samples that are indicated by Map No. 1 on Table No. 7?

A. I did.

Q. And they appear on the map that is a portion of Complainants' Exhibit No. 3?

A. They do. I stated, I think, in the beginning of the description of the table that all the samples were collected at 1 foot depth. You will notice in the previous description, one or two of them—that three of them were collected from near the bottom.

Q. And how as to the others?

A. The others were all collected at one foot depth.

Q. Doctor, let me direct your attention to Table No. 8 appearing on page 22, of Complainants' Exhibit No. 3 and ask who collected the samples that are indicated by map numbers in that table?

A. The samples were all collected by me personally and transported to the laboratory where they were examined by me personally.

Q. Taking the map number as it appears in Table No. 8, indicate where you collected the various samples?

A. The results show the chemical analyses of water taken from various points at different depths in the upper New York Bay. The samples were collected from a boat on January 28th, 1906, between 10 A. M. and 3.30 P. M.

Table No. 7, Page 21.

(As printed.)

Map No.	Point of collection of sample.	Time.	Bacteria per c. c.	Tests for B. Coli. 0.1 c. c.	1.0 c. c.	10 c. c.
		p. m.				
141	Hudson River, opposite Spuyten Duyvil	12:42	3,550	x	x	x
142	Hudson River, north of Fort Washington Point	12:50	2,230	x	x	x
143	Hudson River, south of Fort Washington Point	1:05	2,310	x	x	x
144	Hudson River, off Grant's tomb, bottom	1:15	3,210	x	x	x
145	Hudson River, off Grant's tomb, surface	1:20	2,640	0	x	x
146	Hudson River, off West 80th street	2:45	2,900	x	x	x
147	Hudson River, off West 40th street	3:05	4,680	x	x	x
		a. m.				
148	East River, off Battery, bottom	9:55	4,280	x	x	x
149	East River, off Battery, surface	10:00	6,250	x	x	x
150	East River, Pier No. 15	10:05	4,410	x	x	x
151	East River, under Manhattan bridge	10:10	8,460	x	x	x
152	East River, below Blackwell's Island, bottom	10:40	8,320	x	x	x
153	East River, below Blackwell's Island, surface	10:45	8,940	x	x	x
154	East River, above Blackwell's Island	11:05	9,130	x	x	x
155	East River, off Randall's Island	11:20	8,740	x	x	x
156	Harlem River, first bridge	11:30	7,200	x	x	x
157	Harlem River, third bridge	11:35	3,640	x	x	x
158	Harlem River, fifth bridge, Madison avenue	11:40	3,260	x	x	x
159	Harlem River, seventh bridge	11:45	2,970	0	x	x
160	Harlem River, Highbridge, bottom	11:50	2,760	0	0	x
161	Harlem River, Highbridge, surface	11:55	3,530	x	x	x
		p. m.				
162	Harlem River, above Washington bridge	12:05	3,675	0	x	x
163	Harlem River, opposite N. Y. University	12:15	1,680	0	0	x
164	Harlem River, Broadway bridge	12:25	2,400	x	x	x
165	Harlem River, bend of river, between last two bridges	12:35	2,310	0	0	0
166	Harlem River, N. Y. Central bridge	12:40	2,340	0	0	0

Table No. 7, Page 21.

(As corrected.)

Map No.	Point of collection of sample.	Time.	Bacteria per c. c.	Tests for B. Coli. 0.1 c. c.	1.0 c. c.	10 c. c.
		p. m.				
141	Hudson River, opposite Spuyten Duyvil	12:42	3,550	x	x	x
142	Hudson River, north of Fort Washington Point	12:50	2,230	x	x	x
143	Hudson River, south of Fort Washington Point	1:05	2,310	x	x	x
144	Hudson River, off Grant's tomb, bottom	1:15	3,210	x	x	x
145	Hudson River, off Grant's tomb, surface	1:20	2,640	0	x	x
146	Hudson River, off West 80th Street	2:45	2,900	x	x	x
147	Hudson River, off West 40th Street	3:05	4,680	x	x	x
		a. m.				
148	East River, off Battery, bottom	9:55	4,280	x	x	x
149	East River, off Battery, surface	10:00	6,250	x	x	x
150	East River, Pier No. 15	10:05	4,410	x	x	x
151	East River, under Manhattan bridge	10:10	8,460	x	x	x
152	East River, below Blackwell's Island, bottom	10:40	8,320	x	x	x
153	East River, below Blackwell's Island, surface	10:45	8,940	x	x	x
154	East River, above Blackwell's Island	11:05	9,120	x	x	x
155	East River, off Randall's Island	11:20	8,740	x	x	x
156	Harlem River, first bridge	11:30	7,200	x	x	x
157	Harlem River, third bridge	11:35	3,640	x	x	x
158	Harlem River, fifth bridge, Madison avenue	11:40	3,260	x	x	x
159	Harlem River, seventh bridge	11:45	2,970	0	x	x
160	Harlem River, Highbridge, bottom	11:50	2,760	0	0	x
161	Harlem River, Highbridge, surface	11:55	3,530	x	x	x
		p. m.				
162	Harlem River, above Washington bridge	12:05	3,675	0	x	x
163	Harlem River, opposite N. Y. University	12:15	1,680	0	0	x
164	Harlem River, Broadway bridge	12:25	2,400	0	x	x
165	Harlem River, bend of river between last two bridges	12:35	2,310	0	0	0
166	Harlem River, N. Y. Central bridge	12:40	2,340	0	0	0

931 The samples numbers 51, 52 and 53 were collected at the Narrows opposite Fort Hamilton.

Sample No. 51 was collected at 10 A. M. at a depth of 5 feet, and contained .182 of free ammonia; .192 albuminoid ammonia and chlorine 10650 parts per million.

Sample No. 52 was collected at 10.10 A. M. at a 40 foot depth and contained .158 free ammonia; .162 albuminoid ammonia; 12,600 chlorine.

Sample No. 53 was collected at 10.15 A. M. at a depth of 80 feet, and contained .152 free ammonia; .160 albuminoid ammonia; 14600 chlorine.

The next three samples were taken from three quarters of a mile north of Robbins Reef.

Sample No. 54 was collected at 10.53 A. M. at a depth of 5 feet and contains .196 free ammonia; .136 albuminoid ammonia; 8800 chlorine.

Sample No. 55 was collected at 11.15 A. M. at a depth of 40 feet; contains .178 free ammonia; .150 albuminoid ammonia; 12,600 chlorine.

Sample No. 56 collected at 10.58 A. M. at a depth of 80 feet contained .186 free ammonia; 168 albuminoid ammonia and chlorine 1240.

Samples 57, 58, 59, 60, 61, and 62 were collected off the Battery, and Governor's Island in midstream.

Sample No. 57 was collected at 2.40 P. M. at the surface and contained 9700 chlorine. This sample was collected in the bacterial bottle and the amount collected was not sufficient to give the free and albuminoid ammonia which is given by the test. That is true of the other blank samples in the table.

Sample No. 58 collected at 2.30 P. M. at a depth of 5 feet, contained .300 free ammonia; .224 albuminoid ammonia, and 10,200 chlorine.

Sample No. 59, collected at 2.35 P. M. at a depth of 20 feet contained 10,900 parts per million of chlorine.

Q. State where the free ammonia and albuminoid ammonia are not given and why?

932 A. As in sample No. 57, the figures for free and albuminoid ammonia are here amitted as they were collected in small bacterial bottles and the amount obtained was not sufficient for this purpose.

Sample No. 60, collected at 2.22 P. M. at a depth of 40 feet contained .180 free ammonia, .164 albuminoid ammonia, and chlorine 11,700 parts per million.

Sample No. 61, collected at 2.38 P. M. at a depth of 60 feet was also collected in a small bottle and the figures for free and albuminoid ammonia were unobtainable, but the chlorine is 12,800 parts per million.

Sample No. 62, collected at 2.15 P. M. at a depth of 80 feet gave .174 parts per million of free ammonia and .210 of albuminoid ammonia, and 12,900 chlorine.

Samples Nos. 63, 64 and 65 were collected from Robbins Reef, three quarters of a mile off Robbins Reef.

Sample No. 63 was collected at 3.05 P. M. at a depth of 5 feet, with free ammonia of .222; albuminoid ammonia .146 and chlorine 9,100.

Sample No. 64 collected at 3.57 at a depth of 40 feet contained .254 free ammonia, .142 albuminoid ammonia and 13,100 chlorine.

Sample No. 65 collected at 2.45 P. M. at a depth of 80 feet contained .160 parts per million of free ammonia, .140 parts per million of albuminoid ammonia and 13,200 parts per million of chlorine.

Samples Nos. 66, 67 and 68 were collected from the Narrows, the middle of the Narrows.

Sample No. 66 was collected at 3.21 P. M. at a depth of 5 feet and contained .206 free ammonia .150 albuminoid ammonia and 9,400 chlorine.

Sample No. 67 collected at 3.24 P. M. at a depth of 40 feet contained .210 free ammonia, .168 albumnoid ammonia and 10,000 chlorine.

Sample No. 68, collected at 3.30 P. M. at a depth of 80 feet, contained .214 free ammonia, .276 albuminoid ammonia, and 12,800 chlorine.

933 This table was prepared to show the relative amounts of organic matter at the Narrows, Robbins Reef, and at the Battery, together with the dilutions of salt water at these points.

Q. Did you compare Table No. 8 as it appears on Page 22 of Complainants' Exhibit No. 3 with the original notes you made after these chemical examinations?

A. I did, and they correspond in every respect.

Q. To whom did you report the results of your chemical determinations on these samples which are set forth in Table No. 8?

A. These samples were reported to Dr. Soper. The results of the analyses of the samples were reported to Dr. Soper together with the plot of the situations at the points they were taken.

Q. By whom?

A. By me personally.

Q. When you collected these samples, Doctor, what did you do with them?

A. They were placed in an aluminum box and placed in a case in the bottom of this was ice, and then they were put in a leather bag so that the temperature should be kept low during their transporation. They were then taken to Mount Prospect Laboratory where they were examined according to standard methods.

Q. By whom?

A. By me personally.

Q. Did you plot the locations that are indicated by the map numbers on Table No. 8, and if so, how?

A. These locations were plotted by me personally on the map at the time the samples were collected, plot being transmitted to Dr. Soper.

Q. What significance do you attach to the six determinations made and the chemical examinations to which you subjected the samples taken from Robbins Reef as indicated by numbers 54, 55, 56, 63, 64, 65 in Table 8, appearing on page 22 of Complainants' Exhibit No. 3?

—. The samples show the amount of organic matter which is present at this point at varying times and the chlorine results show the dilution which is obtained from salt water. It will be noticed that in general the amount of salt water is greatest at a
934 depth, and the fresh water—for instance——

Q. What?

A. The fresh polluted water is found near the surface.

Q. At the greater depth you say you find a larger amount of sea water per million parts?

A. Yes, sir. That is to say the sea water coming in at the Narrows flows under the fresh water that is coming down from the Hudson River.

Q. And in which did you find the largest amount of organic matter suspended and in solution?

A. The amounts of organic matter in both of these determinations are not very different.

Q. What would that indicate?

A. It may indicate the precipitation of some of the organic matter by the salt water. The results of free and albuminoid ammonia are not particularly indicative of actual pollution, as they often represent other organic matter which is not pollution, so that determination of the actual pollution is much better represented by the bacteriological figures. For instance, albuminoid ammonia may be very high in water which is highly colored through as from see page — *from* leaves yet you would not consider the pollution to be heavy.

Q. It invariably indicates, does it not, the presence of organic matter of some kind?

A. It does. It will be noted that the amounts found are greater considerably at the Battery than at the Narrows or at Robbins Reef

Q. How do these locations compare as to the amount of salt water dilution as indicated by that table?

A. It will be seen that the amount of salt water, the percentage of salt water in the varying portions of the Bay is not very great. The difference in percentage is not very great. That of course, is complicated to some extent by the salt water which comes in to the East River as well as from the Narrows, but the dilution of this salt water—at least the dilution of this fresh polluted water with
935 the salt water is very much less than would be expected, if it were not understood that a large portion of the salt water is in the under-run beneath the fresh, and does not become materially mixed up with it. The chlorine results bear this out very strongly.

Q. Will you describe what you mean by the under-run, Doctor?

A. The under-run is the inflow of the salt water at flood tide, which on account of its specific gravity flows beneath the fresh water, raising the fresh water above and holding back the flow from the Hudson River during that time, so much so, in fact that the Hudson River flows around the Battery and into the East River at such time as the tides in the East River are different from those in the harbor.

Q. Does the tidal phenomena complicate the matters you were just discussing?

A. Very materially.

Q. Doctor, permit me to direct your attention to Table No. 9, ap-

pearing on page 23 of Complainants' Exhibit No. 3 and ask who secured the samples that are indicated by number in that table?

A. The samples were collected by me personally and taken to Mount Prospect Laboratory where they were examined by me personally. They represent the results of chemical analyses of water taken from various points at different depths in the Upper New York Bay. The samples were collected from a boat on January 30th, 1906, between 11 A. M. and 3.40 P. M. Samples Nos. 69, 70, 71, were collected from the Narrows opposite Fort Hamilton.

Sample No. 69 was collected at 11.12 A. M. at a depth of 5 feet with free ammonia of .186 albuminoid ammonia .126, and chlorine 10,900.

Sample No. 70, collected at 11.05 A. M. at a depth of 40 feet gives free ammonia .144, albuminoid ammonia .126 chlorine 13,700.

Sample No. 71, collected at 11 A. M. at a depth of 80 feet. This was a bacterial sample and the free and albuminoid ammonia were not given as the amounts collected were not sufficient for that determination. The chlorine was 14,500.

936 Samples 72, 73 and 74 represent the water at three quarters of a mile north of Robbins Reef.

Sample No. 72, collected at 12.10 P. M. at a depth of 5 feet gives free ammonia .264; albuminoid ammonia .134, chlorine 10,500.

Sample No. 73, collected at 12 M. at a depth of 40 feet gives free ammonia .186, albuminoid ammonia .156, chlorine 11,700.

Sample No. 74, collected at 11.55 A. M. at a depth of 80 feet gives free ammonia, .156; albuminoid ammonia .174; chlorine 12,800.

Samples 75, 76, 77, 78, 79 and 80 were collected off the Battery and Governor's Island in midstream. Sample 75 was collected at 12.35 P. M. at a depth of 5 feet and gives .194 of free ammonia, .156 of albuminoid ammonia, and 7,600 chlorine.

Sample No. 76, collected at 12.30 P. M. at a depth of 40 feet gives free ammonia, .168; albuminoid ammonia .146, chlorine 11,600.

Sample No. 77 collected at 12.20 P. M. at a depth of 80 feet gives free ammonia .150, albuminoid ammonia .146, chlorine 12,700.

Sample No. 78, collected at 3.15 P. M. at a depth of 5 feet gives free ammonia, .222, albuminoid ammonia .146, chlorine 9,100.

Sample No. 79 collected at 3.10 P. M. at a depth of 40 feet contained free ammonia at .140, albuminoid ammonia .134; chlorine 13,100.

Sample No. 80, collected at 3 P. M. at a depth of 80 feet gives free ammonia, .142, albuminoid ammonia .144, chlorine 13,200.

Samples Numbers 81, 82 and 83 were collected three quarters of a mile north of Robbins Reef.

No. 81 was collected at 3.40 P. M. at a depth of 5 feet, free ammonia at .190, albuminoid ammonia .134, and chlorine 10,400.

Sample No. 82 was collected at 3.32 P. M. at a depth of 40 feet and gives free ammonia .156, albuminoid ammonia, .146, chlorine 12,400.

Sample No. 83 was collected at 3.26 P. M. at a depth of 80 feet and gives free ammonia .154, albuminoid .152, chlorine 12,500.

COMPLAINANTS' EXHIBIT No. 3.

Table No. 8, Page 22.

(As Printed.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Free ammonia.	Albuminoid ammonia.	Chlorine.
		a. m.				
51.	Narrows opposite Fort Hamilton	10:00	5	.182	.192	10,650
52.	Narrows opposite Fort Hamilton	10:10	40	.158	.162	12,600
53.	Narrows opposite Fort Hamilton	10:15	80	.152	.160	14,600
54.	¾ mile north Robbins Reef	10:53	5	.196	.136	8,800
55.	¾ mile north Robbins Reef	11:15	40	.178	.150	12,600
56.	¾ mile north Robbins Reef	10:58	80	.186	.168	12,400
		p. m.				
57.	Off Battery and Governor's Island, midstream	2:40	*	....	....	9,700
58.	Off Battery and Governor's Island, midstream	2:30	5	.300	.224	10,200
59.	Off Battery and Governor's Island, midstream	2:35	20	....	....	10,900
60.	Off Battery and Governor's Island, midstream	2:22	40	.180	.164	11,700
61.	Off Battery and Governor's Island, midstream	2:38	60	....	....	12,800
62.	Off Battery and Governor's Island, midstream	2:15	80	.174	.210	12,900
63.	¾ mile north Robbins Reef	3:05	5	.222	.146	9,100
64.	¾ mile north Robbins Reef	3:57	40	.254	.142	13,100
65.	¾ mile north Robbins Reef	2:45	80	.160	.140	13,200
66.	Narrows	3:21	5	.206	.150	9,400
67.	Narrows	3:24	40	.210	.168	10,000
68.	Narrows	3:30	80	.214	.276	12,800

* At surface.

Q. Did you compare the figure and determinations and
938 matters set forth in Table No. 9 as it appears on page 23 of Complainants' Exhibit No. 3 with your original notes?

A. I did and it corresponds in every respect.

—. There was a figure there, Doctor, I do not know whether you got it right or not. It was Map No. 78, it is here .200 free ammonia?

A. .220 is correct.

Q. Who made the analyses and determinations to fix on the amounts of free ammonia and albuminoid ammonia and chlorine?

A. I did.

Q. What did you do with these samples after you had collected them?

A. The points at which they were collected were plotted on a map showing these points together with the analyses were submitted to Dr. Soper.

Q. Who made these determinations and analyses?

A. They were made by me personally.

Q. Where did you make these analyses?

A. At the Mount Prospect Laboratory.

Q. What inferences did you draw from these figures relating to free and albuminoid ammonia and chlorine?

Mr. Riker: I object to the question on the ground that it is too general. the attention of the witness should be called to the character of the answer required.

Mr. O'Sullivan: Make it "scientific inferences".

Mr. Riker: I object to the question on the ground that it is too general unless it is shown that it has some relation to the subject of this inquiry.

The Commissioner: Note the objection.

Q. What scientific inferences did you draw?

A. The samples were taken at different depths, and they show in general a considerable amount of pollution at the surface and at a depth and that the amount of fresh water is greater at that
939 point, the salt water increasing at a depth. The surface samples were taken at a depth of 5 feet and the surface pollution would have been much more marked if the samples had been taken directly at the surface. Even with this, the differences show up materially.

Q. Doctor, permit me to direct your attention to Table No. 10 appearing on page 24 of Complainants' Exhibit No. 3, and ask who collected the samples indicated by Map numbers on that table?

A. The samples were collected by me personally, and taken to Mount Prospect Laboratory where they were examined by me personally, and they represent the results of chemical analyses of water taken from various points at different depths in the lower Bay and Narrows. The samples were collected from a boat on February 17th. 1906, between 2.45 and 4.40 P. M.

Q. Using the map number to indicate, state where these samples were collected by you and the time at which you took the samples,

the depth below the surface, and whatever the analyses yield to the percentage of free ammonia, albuminoid ammonia and chlorine?

A. Samples numbers 87, 88 and 89 were collected off Norton's Point in the Lower Bay.

Sample No. 87 was collected at 3.30 P. M. at a depth of 5 feet. It gave free ammonia .250, albuminoid ammonia .275, chlorine, 12,500.

Sample No. 88 was collected at 3 P. M. at a depth of 40 feet and gave free ammonia .200 albuminoid ammonia .180, chlorine, 15,300.

Sample No. 89 was collected at 2.45 P. M. at a depth of 80 feet and gave free ammonia, .290, albuminoid ammonia .290, chlorine 15,500.

Samples 90, 91 and 92. collected at the Narrows.

Sample No. 90 was collected at 4.40 P. M. at a depth of 5 feet and gave free ammonia .260, albuminoid ammonia .260 and chlorine 15,500.

Sample No. 91 was collected at 4.25 — at a depth of 40 feet and gave free ammonia .190, albuminoid ammonia .190. chlorine 14,400.

Sample No. 92 was collected at 4.10 P. M. at a depth of
940 80 feet and gave free ammonia .275, albuminoid ammonia .275, chlorine 14,800.

The samples showed the relative pollution which occurred in the Lower Bay. The chlorine results are somewhat higher, considerably higher as would be expected, and also vary with the depth, the more saline water being below.

Q. Is that a uniform condition that you found in your examinations of these samples as indicated in the preceding tables, as well as this one?

A. Yes, sir, practically so.

Q. How would you consider that fact in dealing with the questions of diffusion and distribution, as to whether it would indicate either or neither?

Mr. Riker: I object to the question. The witness has not been qualified to testify as an expert, and that is his opinion, otherwise it is valueless.

The Commissioner: Note the objection.

Mr. O'Sullivan: The question is pressed for the reason that this gentleman has already been qualified as an expert of the very highest order, as a gentleman who has established standard methods for making these very determinations, which have been accepted and held out to the profession by the American Public Health Association.

(Question repeated by the stenographer.)

A. It indicates a certain amount of diffusion, but not an amount which would be expected, if the difference in the specific gravity of those two liquids was not taken into account.

Q. How do you account for the conclusion, which you drew that the free and albuminoid ammonia were found at the surface and at the bottom in larger amount than in the center stratum?

A. These conclusions are more marked from the bacteriological results than they are from the free and albuminoid ammonias. They however, in a general way show this result.

941 Q. Did you compare the figures and items going to make up in tabular form, Table No. 10, as it appears on page 24 of Complainants' Exhibit No. 3, with your original notes?

A. I did.

Q. With what result, Doctor?

A. They correspond in every respect.

Q. Doctor, permit me to direct your attention to Table No. 11 appearing on page 25 of Complainants' Exhibit No. 3 and ask you who collected the samples that are indicated by map number in the first column of that table. The table not only appears on page 25, but extends over on to Page 26 of Complainants' Exhibit No. 3.

A. These samples were all collected and examined by me personally.

Q. When did you collect the samples?

A. They were collected on March 2nd, 1906, between 11 A. M. and 5.15 P. M. and the results show the chemical analyses of the water taken from the various points in the Upper Bay, and the lower ends of the North and East River.

Q. Did you compare that table with your original notes?

A. I have and with the corrections which have already been described, it is correct.

Q. Just indicate the printers' erors that you drew attention to when you first testified on these?

A. Samples Nos. 103 and 104, the results opposite these samples should be interchanged, that is the figures should be interchanged.

Q. That is the results set opposite 103 should be set opposite 104?

A. Yes, should be set opposite 104.

Q. And vice versa?

A. Yes, sir. Also in sample- 132, 133 and 134, the figures for albuminoid ammonia should read respectively .460, .400 and .330. In other respects the table corresponds with the original notes.

Q. Doctor, indicating by map number as it appears on the first column of Table No. 11, pages 25 and 26 of Complainants'

942 Exhibit No. 3, will you, using the map number, indicate where you secured these *these* various samples, and what you did with them, and where you made the analyses and what the results of the analyses were?

A. These samples were all collected and examined by me personally.

Q. Use the map number for a guide, Doctor, where did you secure the samples?

A. Sample No. 93 was collected off Bath Beach, Brooklyn, at 11 A. M. and gave chlorine 10,000.

Sample No. 94 was collected at the head of the Lower Bay off Fort Wadsworth at 11.10 A. M. and gave chlorine 9,600.

Sample No. 95 was collected off Clifton, Staten Island in midstream at 11.15 A. M. and gave chlorine 6,700.

These three samples were not examined for free and albuminoid ammonia.

Sample No. 96 was collected off Tompkinsville, Staten Island at 11.25 A. M. and gave free ammonia, .890, albuminoid ammonia .260, chlorine 6,500.

Sample No. 97 was collected off the west end of Kill von Kull at 11.35 A. M. and gave free ammonia .380, albuminoid ammonia .200, chlorine 7,100.

Sample No. 98 was collected off New Brighton, Staten Island, Kill von Kull, at 11.45 A. M. and gave chlorine 7,000.

Sample No. 99 was collected in Kill von Kull off Sailors' Snug Harbor, Staten Island, at 12 M. and gave chlorine 7,100. These two samples were not examined for free and albuminoid ammonia.

Sample No. 100 was collected at Kill von Kull off of Port Richmond, Staten Island at 12.10 P. M. and gave free ammonia .270; albuminoid ammonia .250, chlorine 7,600.

Sample No. 101 was collected northwest of Robbins Reef Light, was collected at 1.45 P. M. and gave free ammonia, .340, albuminoid ammonia .210, chlorine 6,600.

Sample No. 102 was collected northeast of Robbins Reef Light at 1.50 P. M. and gave chlorine 6,300.

Sample No. 103, was collected northwest of Liberty Island
943 and gave chlorine 6,900.

Sample No. 104 collected midway between Robbins Reef and Liberty Island, collected at 1.57 P. M. gave free ammonia .340, albuminoid ammonia .190, chlorine 5,300.

Sample No. 105, collected between Liberty Island and Claremont, New Jersey at 2 P. M. gave chlorine 5,700.

Sample No. 106, collected between Ellis Island and Liberty Island, collected at 2.05 P. M. gave chlorine 6,000.

Sample No. 107 collected off Ellis Island, collected at 2.12 P. M. gave chlorine 5,700.

Sample No. 108, northeast of Ellis Island, collected at 2.15 P. M. gave free ammonia .370, albuminoid ammonia .220 chlorine 6,000.

Sample No. 109, collected off the Central Railroad of New Jersey Docks in New Jersey, collected at 2.20 P. M. gave free ammonia .400, albuminoid ammonia, .210, chlorine 6,700.

Sample No. 110, collected off the Pennsylvania Railroad Docks in New Jersey, collected at 2.30 P. M. gave chlorine 6,200.

Sample No. 111, collected off the Erie Railway Docks in New Jersey, collected at 2.45 P. M. gave chlorine 6,000.

Sample No. 112, collected off the Delaware, Lackawanna & Western Railway Company Docks in New Jersey, collected at 2.55 P. M. gave free ammonia .330, albuminoid ammonia .240, chlorine 5,200.

Sample No. 113, collected north of Hoboken, New Jersey, collected at 3.10 P. M. gave chlorine 5,100.

Sample No. 114, collected off Weehawken, New Jersey, collected at 3.25 P. M. gave free ammonia .330, albuminoid ammonia, .250, chlorine 4,800.

Sample No. 115, collected off the American Line Dock, midstream, at 3.35 P. M. gave chlorine 7,000.

Sample No. 116, collected off Pier No. 4, North River Manhattan, collected at 3.40 P. M. gave chlorine 7,500.

Table No. 9, Page 23.

(As Printed.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Free ammonia.	Albuminoid ammonia.	Chlorine.
		a. m.				
69.	Narrows opposite Fort Hamilton	11:12	5	.186	.126	10,900
70.	Narrows opposite Fort Hamilton	11:05	40	.144	.126	13,700
71.	Narrows opposite Fort Hamilton	11:00	80	....	....	14,500
		p m.				
72.	¾ mile north Robbins Reef	12:10	5	.264	.134	10,500
		m.				
73.	¾ mile north Robbins Reef	12:00	40	.186	.156	11,700
		a. m.				
74.	¾ mile north Robbins Reef	11:55	80	.156	.174	12,800
		p. m.				
75.	Off Battery and Governor's Island, midstream	12:35	5	.194	.156	7,600
76.	Off Battery and Governor's Island, midstream	12:30	40	.168	.146	11,600
77.	Off Battery and Governor's Island, midstream	12:20	80	.150	.146	12,700
78.	Off Battery and Governor's Island, midstream	3:15	5	.220	.146	9,100
79.	Off Battery and Governor's Island, midstream	3:10	40	.140	.134	13,100
80.	Off Battery and Governor's Island, midstream	3:00	80	.142	.144	13,200
81.	¾ mile north Robbins Reef	3:40	5	.190	.134	10,400
82.	¾ mile north Robbins Reef	3:32	40	.156	.146	12,400
83.	¾ mile north Robbins Reef	3:26	80	.154	.152	12,500

Sample No. 117, collected off the Battery, Manhattan, at
945 3.38 P. M. gave free ammonia .360, albuminoid ammonia, .280, chlorine 8,300.

Sample No. 118, off Pier No. 6 East River Manhattan at 3.45 P. M. gave chlorine 8,400.

Sample No. 119, collected off Pier No. 13, East River, Manhattan, at 3.55 P. M. gave free ammonia .410, albuminoid ammonia .240, chlorine 8,600.

Sample No. 120, collected off Pier No. 20 East River, Manhattan, at 3.58 P. M. gave free ammonia .370, albuminoid ammonia .210, chlorine 8,800.

Sample No. 121, collected off Pier 28, East River Manhattan, at 4 P. M. gave free ammonia .520, albuminoid ammonia .400, chlorine 8,400.

Sample No. 122, collected off Pier No. 23, East River, Brooklyn at 4.05 P. M. gave chlorine 8,600.

Sample No. 123, collected off the Atlantic Dock, Buttermilk Channel, Brooklyn, at 4.15 P. M. gave free ammonia .400, albuminoid ammonia .250, chlorine 8,600.

Sample No. 124, off Beards Erie Basin, Brooklyn, at 4.20 P. M. gave chlorine 8,600.

Sample No. 125, collected off Gowanus Bay, Brooklyn collected at 4.25 P. M. gave free ammonia .740.

Q. And what was the albuminoid ammonia for sample No. 125?

A. .350.

Q. And the chlorine?

A. The chlorine 8,600.

Q. Now, Sample No. 126?

A. Sample No. 126 was collected off Gowanus and Hamilton Avenue Bridge, Brooklyn. That was in the Gowanus Canal, off the Hamilton Avenue Bridge. Collected at 4.35 P. M. Gave free ammonia 7,000, albuminoid ammonia 1.110, chlorine 6,800.

Sample No. 127, collected between Hamilton Avenue Bridge and the outlet, Brooklyn, collected at 4.40 P. M. gave chlorine 8,500.

Sample No. 128, collected off Prince Line Dock, Brooklyn,
946 at 4.50 P. M. gave chlorine 8,400.

Sample No. 129, collected off 56th Street, Brooklyn at 5 P. M. gave chlorine 7,900.

Sample No. 130, collected off 65th Street, near sewer, Brooklyn, collected at 5:05 P. M. gave free ammonia 8.700, albuminoid ammonia 1.430, chlorine 6,500.

Sample No. 131 off Crescent Club Brooklyn, collected at 5:15 P. M. gave chlorine 8,000.

Sample No. 132, collected at the oyster beds at the mouth of Bodine Creek, Port Richmond, collected at 12:35 P. M. gave free ammonia .460.

Q. What is the free ammonia?

A. It is changed now you know. It is .460, and the albuminoid ammonia .260 and chlorine 5,000.

Sample No. 133 collected at Bodine Creek, midway to the head

at crossing, at 12:30 P. M. gave free ammonia .400, albuminoid ammonia .240, chlorine 2,000.

Sample No. 134, Bodine Creek, Upper end, collected at 12:35 P. M. gave free ammonia .330, albuminoid ammonia .280, and chlorine 490.

Sample No. 135, Rahway River, New Jersey, below the sewer outlet at 12:30 P. M. gave free ammonia .380, albuminoid ammonia .320, chlorine 6.

Q. Six what?

A. Six parts per million. That is in the upper part of the river.

Sample No. 136, collected from the Rahway River, New Jersey, over Oyster beds at 2:15 P. M. gave free ammonia .270, albuminoid ammonia .310, chlorine 240.

Q. Did you compare the figures and items in Table No. 11, as it appears on pages 25 and 26 in Complainants' Exhibit No. 3 with your original notes?

A. I did, and the corrections have already been indicated.

Q. And in giving this testimony you have given these corrected items?

947 A. Yes, sir.

Q. To whom did you report the results of your examinations of these samples?

A. To Doctor Soper, together with a plot of the situation in which the samples were taken.

Q. Where was the examination conducted?

A. At Mount Prospect Laboratory, Brooklyn.

Q. By whom.

A. By me personally.

Q. What methods did you employ, Doctor, in making your determinations?

A. Methods which are standardized by the American Public Health Association.

Q. What inferences did you draw, if any, from these determinations for free ammonia, albuminoid ammonia and chlorine as tabulated in Table No. 11, and as set forth on pages 25 and 26 of Complainants' Exhibit No. 3.

Mr. Riker: The question is objected to as not limited to the subject of this inquiry.

The Commissioner: Note the objection.

A. Well, the varying amounts of chlorine obtained in these samples show the degree to which the samples are diluted with salt water. The free and albuminoid ammonia show to some extent the amount of organic matter which was present at the various points indicated. These amounts are very considerable, at least off Tompkinsville, and in the Kill von Kull, and at the various points along the Lower East River at Manhattan, and are represented as practically sewage in Gowanus Canal and in the harbor opposite 65th Street in Brooklyn.

At 1 p. m. adjourned for noon recess until 2 p. m.

948

CITY HALL, NEW YORK,
November 24th, 1911—2 p. m.

Dr. DANIEL D. JACKSON, a witness called on behalf of Complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan (resumed):

Q. Doctor, to whom did you report the results as related in Table No. 11 on pages 25 and 26 of Complainants' Exhibit No. 3?

A. Those results were reported together with the plotting of the location from which the samples were taken to Dr. Soper.

Q. Did you compare table No. 11 with the original notes taken?

A. Yes, sir.

Q. And how did you find it?

A. As testified to previously at the beginning.

Q. Now, Doctor, directing your attention to Table No. 12 on Page No. 27 of Complainants' Exhibit No. 3, I ask you who collected the sample indicated in that table by map number?

A. I collected the samples and examined them personally, personally examined them.

Q. When did you collect these samples?

A. These samples were collected on April 1st, 1906, between 9.55 A. M. and 3.05 P. M.

Q. What did you do with the samples after collecting them?

A. The samples were collected in sterilized bottles, taken to Mount Prospect Laboratory, where they were examined for free and albuminoid ammonia and chlorine.

Q. By whom were they examined?

A. By me.

Q. Now, taking the map numbers as they appear in the first column, will you state from what points you made the collection of samples and what the analyses revealed in each particular sample as you go along?

A. Sample No. 141, collected in Hudson River, opposite Spuyten Duyvil, at 12.42 P. M. gave free ammonia .150, albuminoid ammonia .220, chlorine 290.

Sample No. 142, taken from the Hudson River north of Fort Washington point at 12.50 P. M. gave free ammonia .190, albuminoid ammonia .210, and chlorine 250.

Table No. 10, Page 24.

(As Printed.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Free ammonia.	Albuminoid ammonia.	Chlorine.
		p. m.				
87.	Off Norton's Point, Lower Bay	3:30	5	.250	.275	12,500
88.	Off Norton's Point, Lower Bay	3:00	40	.200	.180	15,300
89.	Off Norton's Point, Lower Bay	2:45	80	.290	.290	15,500
90.	Narrows	4:40	5	.260	.260	12,800
91.	Narrows	4:25	40	.190	.190	14,400
92.	Narrows	4:10	80	.275	.275	14,800

950 Sample No. 144, taken from the Hudson River off Grant's Tomb, at the bottom, at 1.15 P. M. gave free ammonia .250, albuminoid ammonia .240, chlorine 7,700.

Sample No. 146 taken from the Hudson River off Grant's Tomb, at the surface at 1.20 P. M. gave free ammonia .230, albuminoid ammonia .300, chlorine 510.

Q. The point in front of the five is a printer's mistake, isn't it?

A. Is there a point in your book?

Q. Yes.

A. Yes, that should be omitted.

Sample No. 146, taken from the Hudson River off west 80th Street at 2.45 P. M. gave free ammonia .170, albuminoid ammonia .250, chlorine 990.

Sample No. 147, taken from the Hudson River off 40th Street at 3.05 P. M. gave free ammonia .260, albuminoid ammonia, .250, chlorine 1150.

Sample No. 148, taken from the East River off the Battery at the bottom at 9.55 A. M. gave free ammonia .310, albuminoid ammonia .270, chlorine 11,800.

Sample No. 149, taken from the East River off the Battery at the surface taken at 10 A. M. gave free ammonia .320, albuminoid ammonia .270, chlorine 6,100.

Sample No. 150, being from the East River off Pier No. 15, at 10.05 A. M. gave chlorine 4,800.

Sample No. 151, taken from the East River under Manhattan Bridge at 10.10 A. M. gave free ammonia .490, albuminoid ammonia .320, chlorine, 9,600.

Sample No. 152, taken from the East River below Blackwell's Island, at the bottom at 10.40 A. M. gave free ammonia .380, albuminoid ammonia .290, chlorine 11,900.

Sample No. 153, taken from the East River below Blackwell's Island at the surface at 10.45 A. M. gave free ammonia .500, albuminoid ammonia .360, chlorine 10,900.

Table No. 11, Page 25.

(As printed.)

Map No.	Point of collection of sample.	Time.	Free ammonia.	Albuminoid ammonia.	Chlorine.
		a. m.			
93	Off Bath Beach, Brooklyn	11:00	....	....	10,000
94	Head of Lower Bay, off Fort Wadsworth Narrows	11:10	....	....	9,000
95	Off Clifton, Staten Island, mid-stream	11:15	....	....	6,700
96	Off Tompkinsville, Staten Island	11:25	.800	.200	6,500
97	West end of Kill von Kull	11:35	.380	.200	7,100
98	Off New Brighton, Staten Island, Kill von Kull	11:45	....	....	7,800
		m.			
99	Kill von Kull, off Sailors' Snug Harbor, Staten Island	12:00	....	....	7,100
		p. m.			
100	Kill von Kull, off Port Richmond, Staten Island	12:10	.270	.250	7,600
101	Northwest Robbins Reef Light	1:45	.340	.210	6,000
102	Northeast Robbins Reef Light	1:50	....	....	6,300
103	Southwest of Liberty Island	1:57	.340	.190	5,300
104	Midway between Robbins Reef and Liberty Island	1:55	....	....	6,000
105	Between Liberty Island and Claremont, N. J.	2:00	....	....	5,700
106	Between Ellis Island and Liberty Island	2:05	....	....	6,000
107	Off Ellis Island	2:12	....	....	5,700
108	Northeast of Ellis Island	2:15	.370	.220	6,000
109	Off C. R. R. of N. J. Docks, N. J.	2:20	.400	.210	6,700
110	Off Penn. R. R. Docks, N. J.	2:30	....	....	6,200
111	Off Erie R. R. Docks, N. J.	2:45	....	....	6,000
112	Off D., L. & W. R. R. Docks, N. J.	2:55	.330	.240	5,300

113	North of Hoboken, N. J.	3:10	....	....	5,100
114	Off Weehawken, N. J.	3:25	.330	.200	4,800
115	Off American Line Dock, mid-stream	3:35	....	....	7,000
116	Off Pier No. 4, North River, Manhattan	3:40	....	....	7,500
117	Off Battery, Manhattan	3:58	.390	.280	8,300
118	Off Pier No. 6, East River, Manhattan	3:45	....	....	8,400
119	Off Pier No. 13, East River, Manhattan	3:55	.410	.240	8,000
120	Off Pier No. 20, East River, Manhattan	3:58	.370	.210	8,600
121	Off Pier No. 28, East River, Manhattan	4:00	.530	.400	8,400
122	Off Pier No. 23, East River, Brooklyn	4:05	....	....	8,600
123	Off Atlantic Docks, Buttermilk Channel, Brooklyn	4:15	.400	.250	8,600
124	Off Beards, Erie Basin, Brooklyn	4:20	....	....	8,600
125	Off Gowanus Bay, Brooklyn	4:25	.760	.350	8,600
126	Off Gowanus and Hamilton Ave. bridge, Brooklyn	4:35	7.000	1.110	6,800
127	Between Hamilton Ave. bridge and outlet, Brooklyn	4:40	....	....	8,500
128	Off Prince Line Dock, Brooklyn	4:50	....	....	8,400
129	Off 50th street, Brooklyn	5:00	....	....	7,900
130	Off 65th street, near sewer, Brooklyn	5:05	3.700	1.430	6,500
131	Off Crescent Club, Brooklyn	5:15	....	....	8,000
132	At oyster beds, mouth of Bodine Creek, Port Richmond	12:35	.270	.200	5,000
133	Bodine Creek, midway to head at crossing	12:20	.400	.240	2,000
134	Bodine Creek, upper end	12:05	.400	.280	400
135	Rahway River, N. J., below sewer outlet	12:30	.380	.320	6
136	Rahway River, N. J., over oyster beds	2:15	.270	.210	240

Table No. 11, Page 25.

(As corrected.)

Map No.	Point of collection of sample.	Time.	Free ammonia.	Albuminoid ammonia.	Chlorine.
		a. m.			
93	Off Bath Beach, Brooklyn	11:00	....	....	10,000
94	Head of Lower Bay, off Fort Wadsworth Narrows	11:10	....	....	9,000
95	Off Clifton, Staten Island, mid-stream	11:18	....	....	6,700
96	Off Tompkinsville, Staten Island	11:25	.800	.260	6,500
97	West end of Kill von Kull	11:35	.380	.200	7,100
98	Off New Brighton, Staten Island, Kill von Kull	11:45	....	....	7,000
		m.			
99	Kill von Kull, off Sailors' Snug Harbor, Staten Island	12:00	....	....	7,100
100	Kill von Kull, off Port Richmond, Staten Island	12:10	.270	.250	7,000
101	Northwest Robbins Reef Light	1:45	.340	.210	6,000
102	Northeast Robbins Reef Light	1:50	....	....	6,200
103	Southwest of Liberty Island	1:58	....	....	6,000
104	Midway between Robbins Reef and Liberty Island	1:57	.340	.190	5,200
105	Between Liberty Island and Claremont, N. J.	2:00	....	....	5,700
106	Between Ellis Island and Liberty Island	2:05	....	....	6,000
107	Off Ellis Island	2:12	....	....	5,700
108	Northeast of Ellis Island	2:15	.370	.220	6,000
109	Off C. R. R. of N. J. Docks, N. J.	2:20	.400	.210	6,700
110	Off Penn. R. R. Docks, N. J.	2:30	....	....	6,200
111	Off Erie R. R. Docks, N. J.	2:45	....	....	6,000
112	Off D., L. & W. R. R. Docks, N. J.	2:55	.320	.240	5,200

113	North of Hoboken, N. J.	3:10	....	....	5,100
114	Off Weehawken, N. J.	3:25	.330	.200	4,800
115	Off American Line Dock, mid-stream	3:35	....	....	7,000
116	Off Pier No. 4, North River, Manhattan	3:40	....	....	7,500
117	Off Battery, Manhattan	3:58	.300	.280	8,300
118	Off Pier No. 6, East River, Manhattan	3:45	....	....	8,400
119	Off Pier No. 13, East River, Manhattan	3:55	.410	.240	8,600
120	Off Pier No. 20, East River, Manhattan	3:58	.370	.210	8,800
121	Off Pier No. 28, East River, Manhattan	4:00	.320	.400	8,400
122	Off Pier No. 23, East River, Brooklyn	4:05	....	....	8,000
123	Off Atlantic Docks, Buttermilk Channel, Brooklyn	4:15	.400	.220	8,000
124	Off Beards, Erie Basin, Brooklyn	4:20	....	....	8,000
125	Off Gowanus Bay, Brooklyn	4:25	.740	.330	8,000
126	Off Gawanus and Hamilton Ave. bridge, Brooklyn	4:35	7.000	1.110	6,800
127	Between Hamilton Ave. bridge and outlet, Brooklyn	4:40	....	....	8,500
128	Off Prince Line Dock, Brooklyn	4:50	....	....	8,400
129	Off 50th street, Brooklyn	5:00	....	....	7,900
130	Off 65th street, near sewer, Brooklyn	5:05	3.700	1.430	6,500
131	Off Crescent Club, Brooklyn	5:15	....	....	9,000
132	At oyster beds, mouth of Bodine Creek, Port Richmond	12:35	.270	.200	5,000
133	Bodine Creek, midway to head at crossing	12:30	.460	.240	2,000
134	Bodine Creek, upper end	12:35	.400	.280	400
135	Rahway River, N. J., below sewer outlet	12:30	.380	.320	6
136	Rahway River, N. J., over oyster beds	2:15	.270	.310	240

Sample No. 154, taken from the East River above Black-
953 well's Island at 11.05 A. M. gave free ammonia .360, albuminoid ammonia .370, chlorine 12,300.

Sample No. 155, taken from the East River off Randall's Island at 11.20 A. M. gave free ammonia .870, albuminoid ammonia .720, chlorine 10,900.

Sample No. 156, taken from the Harlem River at the first bridge at 11.30 A. M. gave free ammonia .410, albuminoid ammonia .450, chlorine 8,700.

Sample No. 157, taken from the Harlem River at the Third Bridge at 11.35 A. M. gave chlorine, 7,800.

Sample No. 158, taken from the Harlem River at the fifth bridge, Madison Avenue, at 11.40 A. M. gave free ammonia .330, albuminoid ammonia .320, chlorine, 7,100.

Sample No. 159, taken from the Harlem River at the seventh Bridge at 11.45 A. M. gave chlorine 4,300.

Q. Was that A. M. or P. M.?

A. A. M.

Sample No. 160, taken from the Harlem River at High Bridge at the bottom at 11.50 A. M. gave free ammonia .170, albuminoid ammonia .220, chlorine 1,400.

Q. Doctor, what does the word "bottom" mean after "Harlem River Bridge" in sample No. 160?

A. That was taken at the bottom of the river as distinguished from the sample taken one foot below the surface.

Sample No. 161 taken from the Harlem River at High Bridge, at the surface at 11.55 A. M. gave free ammonia .270, albuminoid ammonia .250, chlorine 1,300.

Sample No. 162, taken from the Harlem River above Washington Bridge, at 12.05 P. M. gave chlorine 900.

Sample 163, taken from the Harlem River opposite New York University at 12.15 P. M. gave chlorine 800.

954 Sample 164 taken from the Harlem River at Broadway Bridge at 12.25 P. M. gave free ammonia, .140, albuminoid ammonia .230, chlorine 650.

Sample No. 165 taken from the Harlem River at the bend of river, between the last two bridges at 12.35 P. M. gave chlorine 600.

Sample No. 166, taken from the Harlem River at the New York Central Bridge at 12.40 P. M. gave free ammonia .250, albuminoid ammonia .170, chlorine 600.

Q. Who made the determinations in these samples of free ammonia, albuminoid ammonia and chlorine?

A. Those were all made by me personally.

Q. Have you compared the items set forth in Table No. 12, as it appears on page No. 27, of Complainants' Exhibit No. 3, with your original notes?

A. I have, and they entirely correspond.

Q. Did you draw any inferences from these figures, any scientific inferences?

A. It is seen even more strongly in the Hudson River that the salt water remains at the bottom, as for instance in samples 144 and

145 at Grant's Tomb. The chlorine is 7,700 at the bottom as compared with 510 at the surface. In fact at other points along the river wherever there is a depression in the river, salt water collects in those depressions and remains at a high degree of salinity at practically all times.

Q. Who made these determinations?

A. These were made by me personally.

Q. And to whom did you report the facts that you collected these samples and made these determinations and analyses?

A. They were reported to Dr. Soper together with a plot of the situation at which the samples were taken.

Q. And did you plot these map numbers on the map that accampanies Complainants' Exhibit No. 3 or on the original map from which that was copied?

A. I did.

955 Q. Doctor, let me direct your attention to Table No. 13, appearing on page 28 of Complainants' Exhibit No. 3, and ask who collected the samples set forth in that table?

A. Those samples were all collected and examined by me personally.

Q. Where did you take the samples after you collected them?

A. They were taken to Mount Prospect Laboratory where they were examined.

Q. Now, taking the map numbers as indicated in the first column, will you state where you collected those samples from, and what the result of your examination revealed, giving the time when you collected them?

A. These samples were collected for oxygen at various points in different depths in the Upper New York Bay on January 28th, 1906. The collections were made by attaching a small bottle to a very large one in such a way that a large quantity of the water would be siphoned through the small bottle into the large bottles, so that no oxygen which was originally in the sample bottle would remain and that the oxygen would represent merely that which was obtained from the sea water itself.

Q. At what time of the day did you make this collection of samples in Table 13?

A. Between 10 A. M. and 3.30 P. M.

Q. Let me ask you now, Doctor, did you compare that Table No. 13 as it appears on Page 28 of Complainants' Exhibit No. 3, with your original notes?

A. I did, and it corresponds entirely.

Q. Taking the map numbers as they appear in the first column, will you state the locations at which you obtained these samples and what your examination of them determined?

A. Nos. 51, 52, and 53—that that second 51 should be 52 in the point there—51, 52 and 53 were taken from the Narrows opposite Fort Hamilton.

Sample No. 51 was taken at 10 A. M. at a depth of 5 feet and gave 6.49 cubic centimeters of oxygen per liter of water.

956 Q. One moment, Doctor. At what depth did you say for map sample number 51?

A. 5 feet.

No. 52 collected at 10.10 A. M. at a depth of 40 feet and gave 7.14 cubic centimeters of oxygen.

Sample No. 53 at a depth of 80 feet gave 6.27 cubic centimeters of oxygen.

Sample No. 54 was collected three quarters of a mile north of Robbins Reef at 10.53 A. M. at a depth of 5 feet and gave 7.45 cubic centimeters of oxygen per liter.

Sample No. 58 collected off the Battery and Governors Island in midstream, at 2.30 P. M. at a depth of 5 feet gave 7.24 cubic centimeters of oxygen per liter.

No. 63 collected three quarters of a mile north of Robbins Reef collected at 3.05 P. M. at a depth of 5 feet gave 7.68 cubic centimeters of oxygen per liter.

No. 65 collected also three quarters of a mile north of Robbins Reef at 2.45 P. M. at a depth of 80 feet gave 7.15 cubic centimeters of oxygen.

Q. And was that 2.45 A. M. or P. M.?

A. P. M. No. 66 collected at the Narrows at 3.21 P. M. at a depth of 5 feet gave 7.47 cubic centimeters of oxygen.

Q. Did you plot the locations on the map at which you obtained these samples?

A. I did, and the plots together with the examinations were sent to Dr. Soper. These analyses show in a general way about 75 per cent. of dissolved oxygen at the Narrows, as against something like 55 in the Upper Bay near the Battery.

Q. Was this determination of oxygen volumetric?

A. This is entirely volumetric. The results represent the cubic centimeters per liter.

957 Q. The actual amount oxygen in a liter of these samples?

A. The actual amount of oxygen gas in cubic centimeters per liter of water.

Q. To whom did you report the results obtained on analyses of these samples and the locations from which the samples were taken?

A. These results were plotted, the locations of the samples were plotted and the results were sent to Dr. Soper.

Q. Have you compared Table No. 13 as it appears on Page 28 of Complainants' Exhibit No. 3, with your original notes?

A. I have, and it corresponds in every respect.

Q. Let me direct your attention to Table No. 14, Doctor, appearing on page 29 of Complainants' Exhibit No. 3, and ask who collected the samples that are set forth in that tabulation?

A. Those samples were collected by me personally and taken to the Mount Prospect Laboratory where they were examined by me personally.

Q. When did you make the collection?

A. The samples were taken on January 30th, 1906. The results represent the amount of dissolved oxygen per cubic centimeter, the numbers of cubic centimeters of dissolved oxygen per liter, taken at various points and at different depths in Upper New York Bay.

Q. Between what hours did you collect these samples?

A. Between 11 A. M. and 3.40 P. M.

Q. Now, Doctor, taking the map numbers as they appear in the first column, will you state from where you obtained each sample, and the time that you obtained it and the depth below the surface and the amount of oxygen in cubic centimeters per liter, which your analysis revealed?

A. No. 69 at the Narrows, opposite Fort Hamilton, at 11.12 A. M. at a depth of 5 feet, oxygen 8.82.

Q. And what is that 8.82?

A. Cubic centimeters per liter. No. 70 at the Narrows opposite Fort Hamilton, taken at 11.05 A. M. in a depth of 40 feet, gave 7.31 cubic centimeters of oxygen per liter.

958 Sample No. 71 taken from the Narrows opposite Fort Hamilton, at 11 A. M. at a depth of 80 feet gave 7.16 cubic centimeters of oxygen per liter.

Sample No. 72, at three quarters of a mile north of Robbins Reef at 12.10 P. M. at a depth of 5 feet, gave 9.19 cubic centimeters of oxygen per liter.

Sample No. 75 off the Battery and Governors' Island, mid-stream taken at 12.35 P. M. at a depth of 5 feet gave 8.51 cubic centimeters of oxygen per liter.

Sample No. 78 taken off the Battery and Governors Island mid-stream at 3.15 P. M. at a depth of 5 feet gave 8.63 cubic centimeters of oxygen per liter.

Sample No. 81 taken three quarters of a mile north of Robbins Reef at 4.40 P. M. at a depth of 5 feet gave 7.38 cubic centimeters of oxygen per liter.

Q. Per liter of what?

A. Per liter of water.

Q. Of the sample examined?

A. Yes, sir.

Q. Have you compared the facts and figures that appear on Table No. 14 at page 29, Complainants' Exhibit No. 3 with your original notes?

A. I have and they correspond entirely. This table is taken from practically the same points as the previous table and gives practically the same conclusions.

Q. Now, Doctor, I wish to direct your attention to the dates at which you collected these two sets of samples and ask you whether the date that you have testified to, or the dates rather, at which you made these collections, had any influence in determining the amount of oxygen that is normally present or absent under conditions such as obtained at those dates?

A. The first set of samples was obtained January 28th, the second set, January 30th. That was the season of the year when the largest amount of oxygen would be dissolved by the water, due to

959 the low degree of temperature. There are two factors which affect the solution of oxygen in water, being the temperature and the salinity. The higher the degree of salinity, the less the amount of oxygen dissolved, and the higher the temperature the less the amount of oxygen dissolved.

Q. Let me direct your attention to Table No. 15 as it appears on Page 29 of Complainants' Exhibit No. 3 and ask you who collected the samples that appear in that table?

A. These samples were all collected and examined by me personally, at the Mount Prospect Laboratory.

Q. Take the map number as set forth in the first column and will you describe the locations where you collected these samples, stating the time at which you made the collection, the depth below the surface, and the amount of oxygen, giving it in cubic centimeters per liter of water?

A. These samples Nos. 87, 88 and 89 were taken off Norton's Point in the Lower Bay.

Sample No. 87 was taken at 3.30 P. M. at a depth of 5 feet and gave 7.16 cubic centimeters of oxygen per liter.

Sample No. 88, taken off Norton's Point, Lower Bay, at 3 P. M. at a depth of 40 feet gave 7.46 cubic centimeters per liter.

Sample No. 89 off Norton's Point, Lower Bay, collected at 2.45 P. M. at a depth of 80 feet, gave 8.13 cubic centimeters per liter.

The next three samples were collected at the Narrows. Samples Nos. 90, 91 and 92. Sample No. 90 was colleted at 4.40 P. M. at a depth of 5 feet and gave 6.71 cubic centimeters per liter.

No. 91 was collected at 4.25 P. M. at a depth of 40 feet and gave 7.68 cubic centimeters per liter.

Sample No. 92 was collected at 4.10 P. M. at a depth of 80 feet and gave 6.86 cubic centimeters per liter.

Q. Did you compare tables Nos. 14 and 15 as they appear on page 29 of Complainants' Exhibit No. 3, with your original notes?

960 A. I did, and they entirely correspond.

Q. To whom did you report the locations at which you obtained the samples, the time and depth below the surface, and the oxygen that your analysis revealed?

A. To Dr. Soper.

Q. Did you plot on the original map the locations at which you obtained these samples?

A. I did, and submitted them at the time that the samples were submitted, the analysis and the samples were submitted.

Q. Who conducted the chemical examination of these samples in Tables Nos. 13, 14 and 15?

A. The analyses were made by me personally.

Q. Doctor, let me direct your attention to Table No. 16 on page 30 of Complainants' Exhibit No. 3 and ask you who collected the samples that are set forth in that table?

A. These samples were collected by me personally, and examined by me personally at Mount Prospect Laboratory.

Q. Taking the map number as it appears in the first column of that table No. 16 on page 30, of Complainants' Exhibit No. 3, will you state the points at which you made the collection of samples, the time at which you made the collection and the amount of oxygen determined by your examination?

A. These analyses show the cubic centimeters of oxygen per liter

of water, taken from various points in the Upper Bay and lower ends of the East and North Rivers.

No. 96 was taken off Tompkinsville, Staten Island, at 11.25 A. M. and gave oxygen 7.94 cubic centimeters per liter.

Sample No. 97 was taken from the west end of the Kill von Kull at 11.35 A. M. and gave 7.52 cubic centimeters of oxygen per liter.

Sample No. 100, from the Kill von Kull off of Port Richmond, Staten Island, taken at 12.10 P. M. gave 6.69 cubic centimeters per liter.

Table No. 12, Page 27.

(As printed.)

Map No.	Point of collection of sample.	Time.	Free ammonia.	Albuminoid ammonia.	Chlorine.
		p. m.			
141	Hudson River, opposite Spuyten Duyvil	12:42	.150	.220	280
142	Hudson River, north of Fort Washington Point	12:50	.190	.210	250
143	Hudson River, south of Fort Washington Point	1:05	.150	.190	810
144	Hudson River, off Grant's tomb, bottom	1:15	.250	.240	7,700
145	Hudson River, off Grant's tomb, surface	1:20	.230	.300	510
146	Hudson River, off West 80th street	2:45	.170	.250	990
147	Hudson River, off West 40th street	3:05	.260	.250	1,150
		a m.			
148	East River, off Battery, bottom	9:55	.310	.270	11,800
149	East River, off Battery, surface	10:00	.320	.270	6,100
150	East River, off Pier No. 15	10:05	....	....	4,800
151	East River, under Manhattan bridge	10:10	.490	.320	9,600
152	East River, below Blackwell's Island, bottom	10:40	.380	.290	11,900
153	East River, below Blackwell's Island, surface	10:45	.500	.360	10,900
154	East River, above Blackwell's Island	11:05	.360	.370	12,300
155	East River, off Randall's Island	11:20	.870	.720	10,900
156	Harlem River, first bridge	11:30	.410	.450	8,700
157	Harlem River, third bridge	11:35	....	....	7,800
158	Harlem River, fifth bridge, Madison Ave	11:40	.330	.320	7,100
159	Harlem River, seventh bridge	11:45	....	....	4,300
160	Harlem River, Highbridge, bottom	11:50	.170	.220	1,400
161	Harlem River, Highbridge, surface	11:55	.270	.220	1,300
		p. m.			
162	Harlem River, above Washington bridge	12:05	....	....	900
163	Harlem River, opposite N. Y. University	12:15	....	....	800
164	Harlem River, Broadway bridge	12:25	.140	.230	650
165	Harlem River, bend of river between last two bridges	12:35	....	....	600
166	Harlem River, N. Y. Central bridge	12:40	.250	.170	600

Sample No. 107, taken off Ellis Island at 2.12 P. M. gave
962 6.79 cubic centimeters per liter.

Sample No. 113, taken north of Hoboken, New Jersey, at 3.10 P. M. gave 7.61 cubic centimeters per liter.

Sample No. 114 off Weehawken, New Jersey at 3.25 P. M. gave 7.62 cubic centimeters per liter.

Sample 121 off Pier No. 28 East River Manhattan at 4 P. M. gave 6.89 cubic centimeters per liter.

Sample No. 123 off Atlantic Docks, Buttermilk Channel, Brooklyn, at 4.15 P. M. gave 6.54 cubic centimeters per liter.

Sample No. 125 off Gowanus Bay Brooklyn at 4.25 P. M. gave 5.63 cubic centimeters per liter.

Sample No. 126 off Gowanus and Hamilton Avenue Bridge, Brooklyn, taken at 4.35 P. M. gave no oxygen .00.

Sample No. 130, taken off 65th Street sewer Brooklyn at 5.05 P. M. gave 4.86 cubic centimeters per liter.

Sample No. 134 taken off the upper end of Bodine Creek, at 12.25 P. M. gave 7.50 cubic centimeters per liter.

Q. When did you collect these samples?

—. These samples were collected on March 2nd, 1906 between 11.25 A. M. and 6.05 P. M.

Q. Did you regard the time of year at which samples for oxygen determinations are to be made as important?

A. The amount of dissolved oxygen in the Winter time is considerably higher than in the Summer and a comparison of these figures with the amounts normally present in water at nearly freezing temperatures is necessary in order to give the proper result.

Q. Did you compare the facts set forth in tabular form in Table No. 16 as it appears on Page 30 of Complainants' Exhibit No. 3 with your original notes, Doctor?

A. I did and all the facts are correct except Sample No. 130, Map No. 130, which should be 4.86 instead of 7.86 as printed.

Q. To whom did you report the fact that you had collected these samples, the time at which you made the collection, and what your chemical examinations revealed?

A. These results were together with the plot of the location
963 at which the samples were taken, submitted to Dr. Soper.

Q. Do you recall the hours between which you collected these samples?

A. I do not recall it, but it is given here 11.25 A. M. to 5.05 P. M. which corresponds to the original notes.

Q. Doctor, let me direct your attention to Table 17, as it appears on Page 31, of Complainants' Exhibit No. 3, and ask you who collected the samples there appearing in tabular form together with the time and the oxygen determination of each sample?

A. These samples were collected and examined by me personally at the Mount Prospect Laboratory Brooklyn.

Q. Were they collected by you?

A. Yes, sir. They represent the results of analyses of water for the amount of dissolved oxygen in cubic centimeters per liter of

water at various points surrounding Manhattan Island, on April 1st, 1906, between 9.55 A. M. and 1.15 P. M.

Q. Taking the map number indicating the location, will you state the point at which you took these samples, Doctor, and the time, and the oxygen determined to be present in cubic centimeters per liter of the sample examined?

A. *Map* No. 144, taken from the Hudson River off Grant's Tomb, at the bottom, gave oxygen 8.80 cubic centimeters per liter of water.

Sample 145 taken from the Hudson River at Grant's Tomb, at the surface, at 1.20 P. M. gave 9.15 cubic centimeters per liter.

Sample No. 148, taken from the East River off the Battery at the bottom gave—this was taken at 9.55 A. M. gave 8.62 cubic centimeters of oxygen.

No. 149, taken from the East River off the Battery at the surface at 10 A. M. gave 8.84 cubic centimeters.

964 Sample No. 152, taken from the East River below Blackwell's Island at the bottom gave 8.29 cubic centimeters per liter.

No. 153 taken from the East River below Blackwell's Island at the surface at 10.45 gave 8.07 cubic centimeters of oxygen per liter.

Q. And whom did you report the results determined by your chemical methods, and the samples subjected to these chemical methods, giving the locations at which you collected them, to?

A. These results were reported together with a plot showing the points at which the samples were collected to Dr. Soper.

Q. Have you compared the figures set forth in Table No. 17 as it appears on Page No. 31, of Complainants' Exhibit No. 3, with your original notes?

A. I have, and it corresponds in every respect.

Q. How did you collect these samples, by what means?

A. The samples were collected from a boat, using the apparatus previously described. The small bottle connected by a syphon with a very large bottle, through which the water, passing through the small bottle, would be changed several times in filling the large bottle consequently getting an accurate sample of the water as to the dissolved oxygen contents.

Q. Now, taking the dates at which you made the collections which are set forth in Tables Nos. 13, 14 and 15, 16 and 17, in Complainants' Exhibit No. 3, was the time favorable for a high or a low percentage of oxygen.

A. The samples were taken, most of them, in the middle of the winter. All of them in the Winter and Spring, at a time at which the dissolved oxygen was highest in the water. The percentage of dissolved oxygen which the water can absorb is at its highest point. If those figures will be compared with these, it will be found to be considerably higher than the ones given in the tables.

Q. I think I have covered all these tables now Doctor, do you know of anything I have omitted?

965 A. I believe not.

Mr. O'Sullivan: Your witness.

Cross-examination by Mr. Riker:

Q. How old are you, Doctor?
A. 41.
Q. In making these analyses for what body did you make them?
A. I did not get that.
Q. For what body did you make the analyses?
A. For Dr. Soper.
Q. By whom were you paid?
A. By Dr. Soper.
Q. Were you then in the employ of the City of New York?
A. I was.
Q. Your compensation for this special work was not included in your compensation by the City of New York?
A. This was a state commission which had no connection at that time with the City of New York.
Q. In making the first series of samples, getting the first series of samples, what records did you keep at the time when you actually took the samples?
A. My records were kept note books, bound note books, together with the analyses which were made from other sources as well.
Q. I am now speaking of the actual taking of the sample from the water?
A. You asked about the records.
Q. I asked you what records you kept at the time that you took the samples?
A. Each sample had a slip, a tag which was tied to the nose of the bottle showing the location and number of the sample.
Q. Anything wlse?
A. A map, which was taken at the time along, was marked, showing the location also.
Q. Did you take the temperature of the samples when you took them?
A. No, sir.
Q. Did you take the temperature of any of the samples as you took them?
A. No, sir, not to my recollection.

COMPLAINANTS' EXHIBIT No. 3.

Table No. 13, Page 28.

(As printed.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Oxygen.
		a. m.		
51.	Narrows opposite Fort Hamilton	10:00	5	6.49
51.	Narrows opposite Fort Hamilton	10:10	40	7.14
53.	Narrows opposite Fort Hamilton	10:15	80	6.27
54.	¾ mile north Robbins Reef	10:53	5	7.45
		p. m.		
58.	Off Battery and Governor's Island, midstream	2:30	5	7.24
63.	¾ mile north Robbins Reef	3:05	5	7.68
65.	¾ mile north Robbins Reef	2:45	80	7.15
66.	Narrows	3:21	5	7.47

967 Q. Now, you have been refreshing your memory presumably from the pamphlet, which you have had before you, and you say that you have compared those copies with the original in your possession; am I right about that?

A. Yes, sir.

Q. Did the originals contain any matters which are not contained in these printed pamphlets?

A. No, sir.

Q. And the matter was stated in the form in which it is stated in these copies that you had?

A. The original contained nothing but figures, that is all, the figures were submitted to Dr. Soper and the observations which are in this book are Dr. Soper's.

Q. Has your testimony then been confined to your recollection of what you did entirely?

A. My testimony has been given regarding the figures and my impression of the significance of those figures.

Q. Prior to March 31st, 1906, how many actual days were you engaged in taking samples for the purpose of analyzing them and reporting to Dr. Soper?

A. That is, how many days did it take to analyze the samples?

Q. I withdraw that question and will put it this way: prior to March 31st, 1906, how many days were you employed in taking samples?

A. I could not answer that question.

Q. The first series of samples which you took I think you testified were taken from an iron steamboat plying between New York and Coney Island?

A. Yes, sir.

Q. And there were seven samples taken by you from that boat?

A. Well, I will have to look and see.

(Witness examines data.)

There were fourteen samples taken, that is there were seven samples taken on the way down and seven samples taken at the same points on the way back, giving the relationship between the ebb and flood tides.

968 Q. That is in the track of the excursion steamers running to Coney Island?

A. It is, of the excursion steamers.

Q. I say they were taken in the track of the excursion steamers going to Coney Island?

A. It was, yes.

Q. And the ocean steamers to a certain extent?

A. Yes, sir.

Q. And were the samples taken at points near the outlet of sewers?

A. No, sir.

Q. How far was the first sample taken from the outlet of a sewer, if you know?

A. It was taken in the middle of the North River opposite Pier 1. It must have been a considerable distance from a sewer.

Q. How far is that from the shore?
A. I should say several hundred feet.
Q. You did — make any attempt to accurately locate it, did you?
A. No, sir.
Q. How far from the surface of the water was the sample taken, how far below the surface?
A. Just below the surface. The bottle was dropped in from the boat, as it was moving, and the sample collected just below the surface and drawn out.
Q. The bottle lay along behind the boat?
A. No, very little.
Q. The boat was in motion, was it not?
A. The boat was in motion.
Q. Do you know whether there was any polluting material being discharged from the boat, at the time when you dropped this bottle overboard?
A. The samples were taken near the bow for that reason, so there would not be.
Q. How far from the bow?
A. Just at the side of the boat, away in front of any excretal that might be dropped from the boat.
Q. Do you deem that a scientific way of getting sample
969 for examination?
A. I do.
Q. Where was the second sample taken?
A. The second sample was taken south of Liberty Island, from the same boat in the same way.
Q. In the track of the excursion steamers?
A. Yes, sir.
Q. Taken in the same way that the first one was?
A. Yes.
Q. Did you take the temperature of the sample when you obtained it?
A. No, sir, I did not.
Q. What time of the year was it?
A. It was in the winter time,—no, that sample was taken June 11th, that first set was taken.
Q. Now, turning to the second set taken, where were they taken, as a general description of them?
A. They were taken at points between St. George and South Beach, on Staten Island.
Q. What was the furthest distance from the shore at which any one sample was taken on this set?
A. These samples were taken usually from the ends of piers and docks, or from points as far as could be obtained from the shore. They were taken from the shore itself, not from a boat.
Q. How far below the surface of the water were these samples taken?
A. 1 foot, as a rule.
Q. Was the shore at the point off of which these samples were taken inhabited?

A. It was.
Q. Sewers discharging at the surface of the water?
A. Yes, sir.
Q. Where was the third set of samples taken, generally speaking?
A. Those were taken between Fort Hamilton and Sea Gate. They represent the waters of Gravesend Bay.
Q. How far from the shore, the furthest point?
A. Usually taken about one hundred feet from the shore.
Q. Is the shore of Gravesend Bay inhabited?
A. It is.

Table No. 14, Page 29.

(As printed.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Oxygen.
		a. m.		
69.	Narrows opposite Fort Hamilton	11:12	5	8.82
70.	Narrows opposite Fort Hamilton	11:05	40	7.31
71.	Narrows opposite Fort Hamilton	11:00	80	7.16
		p. m.		
72.	¾ mile north Robbins Reef	12:10	5	9.19
		p. m.		
75.	Off Battery and Governor's Island, midstream	12:35	5	8.51
78.	Off Battery and Governor's Island, midstream	3:15	5	8.63
81.	¾ mile north Robbins Reef	3:40	5	7.38

971 Q. Sewers discharging directly into the Bay?
A. I think so.
Q. The fourth set of samples where were they taken, speaking generally?
A. They were taken between Stapleton Dock and a point off Tottenville, Staten Island.
Q. How far from the shore at the furthest point, any one sample?
A. These were probably one or two hundred feet from the shore, taken from a boat, skirting the coast.
Q. Is that substantially the same territory that is covered by the second set of samples?
A. No, that was to the north of Staten Island, and this covers the southeasterly shore.
Q. Is this shore also occupied by residents and business places?
A. To some extent, not very many.
Q. Sewers discharging into the water along the shore?
A. I presume there are small sewers along there.
Q. Did you select these points yourself at which the samples were taken, these four sets?
A. These points were selected in a general way by Dr. Soper. That is to say, he told me to take points at regular intervals along the Staten Island shore, and the points were selected where they could be readily located.
Q. The other samples which you took for analysis of some sort or other, were they selected by Dr. Soper or did you select them?
A. They were selected in a general way by Dr. Soper.
Q. All of them?
A. Yes, sir.
Q. Does the salinity of the waters of New York Bay, as far as you have observed, vary from the condition of the winds?
A. I think it does.
Q. And the tides?
A. Yes, sir.
Q. And the amount of water that is being discharged by
972 the fresh water rivers flowing into the Bay?
A. To some extent.
Q. Will you define what you mean by "to some extent"?
A. Well, it depends on whether the fresh water flowing into the Bay becomes thoroughly mixed or partially mixed at least becomes more mixed at one time than another. It never becomes thoroughly mixed.
Q. Is not the surface water of New York Bay affected by the water of the Hudson River as to amount of discharge from that river?
A. Affected in what way?
Q. As to the salinity?
A. I would not say it was affected largely, I should say it was affected.
Q. Have you not testified that fresh water has less specific gravity than salt water?
A I have.

Q. As to the discharge of fresh water by the Hudson River, would it in your judgment be largest upon the surface of the Bay?

A. It would.

Q. And the condition of the Hudson River has a considerable effect on the surface waters of New York Bay, as to salinity?

A. A condition of flood in the Hudson River would make the water at the surface of the harbor, a great deal fresher than ordinarily, as that flood would flow out over the surface to a very large extent. The degree of salinity, which would be added to it, would be less at such a time.

Q. So that the sampling of the waters of the Bay at any one time is not a test of the absolute salinity of the waters of the Bay, is it?

A. No.

Q. It would take a series of observations extending over a considerable period of time to give any reasonably accurate results, would it not?

A. You can get a general impression but it would take a very large number of samples to get an exact idea.

COMPLAINANTS' EXHIBIT No. 3.

Table No. 15, Page 29.

(As printed.)

Map No.	Point of collection of sample.	Time.	Depth below surface in feet.	Oxygen.
		p. m.		
87.	Off Norton's Point, lower bay	3:30	5	7.16
88.	Off Norton's Point, lower bay	3:00	40	7.46
89.	Off Norton's Point, lower bay	2:45	80	8.13
90.	Narrows	4:40	5	6.71
91.	Narrows	4:25	40	7.68
92.	Narrows	4:10	80	6.86

974 Q. Covering a large number of conditions and periods?

A. Yes, and even then your samples vary very materially at different days, different years, under all sorts of different conditions. The variations are very material.

Q. In making the test for the colon bacillus in the samples which you took from the waters surrounding the City of New York, did you attempt to determine the quantity of that particular organism in the samples?

A. Its quantity is determined in a general way by the three dilutions which are taken, in which it is examined.

Q. That is the only means that you apply to determine the quantity in any way?

A. That is the usual means.

Q. Was that the only way that you applied?

A. That is the only way, yes, sir.

Q. Is the colon bacillus always present in the excrement of warm blooded animals?

A. It is.

Q. And is it not an evidence of disease in the animal necessarily, of disease in the animal from which it is discharged?

A. No, sir, it is used as a test of pollution by sewage matter, because it is always present.

Q. The bacterial examination, the tests which you made of the samples, does that necessarily disclose the condition of pollution?

A. No, sir.

Q. What relation has it to pollution?

Mr. O'Sullivan: Did you finish your last answer?

Mr. Riker: He did finish it when he said "no, sir" what other answer could there be possibly, if he said, "no, sir." Do you wish to qualify your answer?

The Witness: I was going to say that it merely represented
975 in a general way the amount of available organic matter present in the water for the purpose of bacterial action. It does not necessarily mean polluted organic matter.

Q. As a matter of fact does not the presence of bacteria in water indicate the presence of free oxygen?

A. No, sir.

Q. It does not?

A. It does not.

Q. Bacteria then can develop and subsist in the absence of free oxygen?

A. Some bacteria can, some cannot. The numbers may be just as high in one case as the other.

Q. Then there are some bacteria which cannot exist in the absence of free oxygen in the water in which it is supposed to be sought for?

A. Yes, sir.

Q. Is the colon bacillus a hardy germ?

A. It is, rather.

Q. And what effect does it have if there is free oxygen in the water?

A. No effect.

Q. None whatever?

A. None whatever.

Q. What effect does salt or salinity in the water have upon this particular germ or micro organism?

A. Apparently no effect.

Q. What is the recognized destructive agency to be applied to this particular bacillus?

A. Any strong antiseptic.

Q. Does heat have any effect?

A. If it is high enough. It grows readily at blood heat.

Q. In the results which you obtained from your bacterial examinations of the samples which you took and examined, you found what you expected to find, did you not?

A. I did not have any previous expectation about it. I found what was there.

Q. And you know that there were discharged into the waters from which you took these samples a very considerable amount of sewage matter, did you not?

A. I did.

Q. Did you not expect to find pollution in the samples which you took?

A. I expected to find it, I did not know what numbers I would find in bacteria; had no idea.

Table No. 16, Page 30.

(As printed.)

Map No.	Point of collection of sample.	Time.	Oxygen.
		a. m.	
96.	Off Tompkinsville, Staten Island	11:25	7.94
97.	West end of Kill von Kull	11:35	7.52
		p. m.	
100.	Kill von Kull, off Port Richmond, Staten Island	12:10	6.69
107.	Off Ellis Island	2:12	6.79
113.	North of Hoboken, N. J	3:10	7.61
114.	Off Weehawken, N. J	3:25	7.62
121.	Off Pier No. 28 East River, Manhattan	4:00	6.98
123.	Off Atlantic Docks, Buttermilk Channel, Brooklyn	4:15	6.54
125.	Off Gowanus Bay, Brooklyn	4:25	5.63
126.	Off Gowanus and Hamilton Ave. bridge, Brooklyn	4:35	.00
130.	Off 65th Street, near sewer, Brooklyn	5:05	7.86
134.	Bodine Creek, upper end	12:25	7.50

COMPLAINANTS' EXHIBIT No. 3.

Table No. 16, Page 30.

(As corrected.)

Map No.	Point of collection of sample.	Time.	Oxygen.
		a. m.	
96.	Off Tompkinsville, Staten Island	11:25	7.94
97.	West End of Kill von Kull	11:35	7.52
		p. m.	
100.	Kill von Kull, off Port Richmond, Staten Island	12:10	6.69
107.	Off Ellis Island	2:12	6.79
113.	North of Hoboken, N. J	3:10	7.61
114.	Off Weehawken, N. J	3:25	7.62
121.	Off Pier No. 28, East River, Manhattan	4:00	6.98
123.	Off Atlantic Docks, Buttermilk Channel, Brooklyn	4:15	6.54
125.	Off Gowanus Bay, Brooklyn	4:25	5.63
126.	Off Gowanus and Hamilton Ave. bridge, Brooklyn	4:35	.00
130.	Off 65th St., near sewer, Brooklyn	5:05	4.86
134.	Bodine Creek, upper end	12:25	7.50

978 Q. But you found bacteria and the colon bacillus as you expected to find it in this sewage, this polluted water?

A. I expected to find it there, I did not know how much I would find.

Q. And was it in any larger amount than you expected to find it?

A. I do not know whether it was or not. I did not form any previous conclusion as to what I would find.

Q. You had not any preconceived notion or any particular interest in the amount you were likely to find.

A. Not particularly.

Q. Now, when did you begin to make your tests for free oxygen in the waters of New York Bay and the surrounding waters?

A. On January 28th, 1906.

Q. Well, did you not recognize as an important element in the question of the pollution of the waters of the New York Bay, the question as to whether the free oxygen was exhausted or approaching exhaustion, before that time?

A. We did, yes.

Q. Why did you not make your tests on the other samples?

Mr. O'Sullivan; I object. The witness has testified that he did all this work under directions.

The Commissioner: Note the objection.

Mr. Riker: And he can answer that way, because he was not directed to do it.

The Witness: I do not know what the question was.

Q. Why did you not make the tests for free oxygen in the samples which you took before?

A. Simply I was not directed to at that time.

Q. You did as you were directed.

A. That was said at the very beginning of the work of the Commission. I presume they had not gotten around to it until this second report.

Q. Your official field of inquiry is in potable waters?

A. Yes, sir.

979 Q. You were not examining the samples which you took from New York Bay as potable waters, were you?

A. No, sir.

Q. What injurious effect in your judgment can result from the presence of the colon bacillus in the waters of New York Bay?

A. The colon bacillus was examined for the purpose of determining the extent to which it was polluted, not the extent which it itself would have—the effect. It would have no effect.

Q. None whatever?

A. None.

Q. What effect, injurious or otherwise, would the presence of the other bacteria, which I believe you discovered in the samples analyzed by you, taken from the waters of New York Bay, what effect would it have upon the waters of New York Bay outside of the fact that they were present there?

A. They show the degree to which the Bay is polluted and the extent to which further pollution may be admitted.

Q. But in themselves, do they have any injurious effect upon the waters of New York Bay?

A. They are tests and intended as tests.

Q. Have you any explanation to give of the presence of bacteria at a depth of 80 feet at which depth you have discovered them in the waters of New York Harbor?

A. Why, at the depth of 80 feet they were present, because of this organic material there for them to feed on, I presume. They live on whatever organic matter exists in sufficient quantities to live on.

Q. Would you as an expert say that organic matter was sewage.

A. The results of the analyses show that sewage was present. You could not say that all the organic matter present was sewage?

Q. The fact of the presence of the colon bacillus is the thing that indicates the presence of sewage, is it not?

A. Yes, sir.

COMPLAINANTS' EXHIBIT No. 3.

Table No. 17, Page 31.

(As printed.)

Map No.	Point of collection of sample.	Time.	Oxygen.
		p. m.	
144.	Hudson River, off Grant's tomb, bottom	1:15	8.80
145.	Hudson River, off Grant's tomb, surface	1:20	9.15
		a. m.	
148.	East River, off Battery, bottom	9:55	8.62
149.	East River, off Battery, surface	10:00	8.84
152.	East River, below Blackwell's Island, bottom	10:40	8.29
153.	East River, below Blackwell's Island, surface	10:45	8.07

981 Q. At that depth?
A. Yes, sir.
Q. How do you account for the presence of sewage material at such a depth?
A. It would be precipitated to some extent from the water above.
Q. And having been precipitated it must have had a higher specific gravity than the water above?
A. The suspended matter in it, yes. In fact that precipitation is going on all the time from sewage above, and very largely deposits this precipitated matter throughout the entire Upper Bay, as is shown by other analyses, not here presented, which I have had access to.
Q. Can you form any estimate of the percentage of the organic matter which would be precipitated from a given amount of sewage at a depth of 40 feet below the surface of New York Bay?
A. It would depend on the amount of organic matter originally present. The precipitation would be dependent on whether it was saturated or not.
Q. And the character of the organic matter held in suspension?
A. It is usually albuminous matter which precipitates.
Q. Would you, in your opinion, from the ordinary sewage discharge expect that amount of precipitation at that depth?
A. Yes, sir.
Q. Whether that was arriving at the surface or not?
A. Yes.
Q. What is the origin, in your judgment of the free oxygen in the water?
A. It is dissolved from the air.
Q. Do you term the process by which it is dissolved a mechanical or a chemical one?
A. Mechanical.
Q. Mechanical?
A. Purely so.
Q. And its presence therefore, would depend, would it not, on whether the water in which it is dissolved has been in contact with air?
A. Yes, and to what degree it had been in contact.
Q. Would it exist at all unless it had been at some time in
982 contact with the air?
A. Probably not.
Q. In the waters of New York Bay then, the process of renewing the free oxygen is going on all the time, is it not?
A. To some extent, at the surface.
Q. It is being brought down rain, is it not?
A. At the surface.
Q. To the surface?
A. Yes.
Q. It is brought down from the rivers, brought down by the water, at the surface of the water?
A. At the surface, yes.

Q. Would or would not it be merely a guess to estimate the rate at which it is absorbed into the waters of New York Bay?

A. I do not know that that could be estimated.

Q. It would be merely a guess in your judgment?

(No answer).

Q. Have you tested the water of any other bay with reference to the percentage of free oxygen contained in it?

A. I think not. I have tested a great many waters, but I do not remember testing any bay outside of that. Comparisons were made with the outer Bay and the inner Bay.

Q. But no other bay in this country has been the subject of tests by you?

A. Not to my recollection.

Q. You therefore have no standard that you have made for yourself?

A. The standard is the same, the water itself, and that has been tested by me many times.

Q. That is the standard by which the waters of New York Bay are tested with reference to free oxygen?

A. Yes, sir.

Q. Do your tests show that the free oxygen in New York Bay has been materially depleted?

A. In the Upper Bay, yes.

Q. To what extent?

A. Generally speaking about 45 per cent.

Q. Now, does that apply to the tests, the samples taken by you in the middle of the Bay?

A. It does.

Q. They are equally deteriorated with the samples taken along the shore?

A. There are variations. There are some points along the shore near the sewer outlets of course, where the depression is even greater than that.

983 Q. What is the percentage of free oxygen in ocean water?

A. That depends on the temperature. There is a variation all the way—in round number from 9 to 11 parts per million, depending on the temperature.

Q. 9 to 11 parts per million, depending on the temperature?

A. I can give you that more accurately in a moment. Those are complicated tables and I will ask to give those figures from this, if I may, printed tables showing the variations and temperatures, at different temperatures of fresh and salt water.

Q. The ocean was what I am speaking of. I asked you about the ocean and you gave me the limits of 9 to 11?

A. I gave it from memory as that.

(Referring to tables.) The variations run from about 8 to nearly 13.

Q. At what temperature is it 8?

A. That is a temperature of about—in the first place, you have got to start with what you consider salt water. You have got to say how much salt there is in it.

Q. You have told me in answer to my questions that there was a standard for sea water?

A. The sea water varies from 18 to 22 parts per million of salt. You have got to know what salt you are going to take as a standard.

Q. You have not an absolute standard?

A. We usually use a standard of 18,000 parts. I will now read you what it is between zero degrees and 30 degrees for 18,000 parts.

Q. State the limit?

A. There is no limit. You can go up as high as you like, it depends on the temperature of the salt water. If it gets up to 30 degrees centigrade—the standard would run from 628 as compared with 1156 at zero. 628 at 30 degrees.

Q. At 30 degrees centigrade represents what Fahrenheit?

A. 30 degrees represents 68 degrees Fahrenheit. It is too high; it would never get that high.

Q. The sea water so far as you know never reaches that in this latitude?

A. I should say it rarely went above 20 degrees, in which case the calculation——

984 Q. What then?

A. Would be from 7.60 to 11.65.

Q. What is the 7.60—7%—what does that represent?

A. Parts per million.

Q. At what temperature?

A. That is at 20 degrees centigrade, 68 degrees Fahrenheit.

Q. So there is that variation in sea water as to free oxygen?

A. Depending on the temperature.

There is also a variation in proportion to the amount of salt in the water, the salinity.

Q. Is there any variation with reference to the conditions at which the sample of sea water is taken?

A. I think not.

Q. You think the free oxygen contained in the ocean does not vary with the depth?

A. Undoubtedly that would make a difference.

Q. At what depth are you assuming as your datum or your standard?

A. This is on the assumption that it is at ordinary pressures.

Q. Now, Doctor, you took some samples for the purpose of determining the free oxygen about three quarters of a mile from Robbins Reef, did you not?

A. Yes, sir.

Q. And I think it is in Table No. 14 on Page 29. Can you recall by refreshing your memory from that what the amount of oxygen in that sample is?

A. Which one do you refer to?

Q. It is No. 72, as I see it, on that Table 14, at page 29?

A. That is 9 cubic centimeters per liter.

Q. How does that compare with your standards of ocean sea water?

A. I would have to calculate to see. The other is parts per million. This is cubic centimeters per liter.

(Witness calculates.) (Continuing the answer.)

The sample taken at that point is just about saturated.

Q. Just saturated?

A. Has the full amount of oxygen at that point. You picked out an unusually high one.

Q. I did not pick it out, I think you picked it out yourself?

A. No, sir.

985 Q. You took the sample yourself?

A. Yes, I took the sample.

Q. Well, then so far as that sample indicates anything there is no exhaustion of the oxygen in the waters of New York Bay?

A. That is correct, as far as that sample goes, but you will note that is the highest figure on the page, considerably higher than the other ones.

Q. I agree with you, that is the highest determination of oxygen in any of the samples?

A. These figures represent just what we found there.

Q. Certainly they do. Your methods I figure are entirely scientific, and science is truth?

A. The point at Robbins Reef is shallow water, and the sewage which is swept down the harbor does not materially stop at that point, and all the analyses which are taken for bacteria and for deposits of mud in the harbor give a very sharp line at that ridge, and at that point there is very little contamination in contradistinction to the rest of the harbor.

Q. Now what function in the pollution problem does that free oxygen in the water play?

A. It helps to oxidize the organic matter through the aid of bacterial agency.

Q. In what way does the bacterial agency enter into the purification?

A. The amount of oxygen used up there is dependent upon the bacterial activity, and the amount of organic matter present. Those two things.

Q. So that the bacteria in relation to this problem may be called beneficent rather than maleficent?

A. They are beneficent when the amount of organic matter is not so high that it uses up too much oxygen. Then it becomes maleficent.

Q. In connection with a reasonable amount of organic matter then, they perform a function of purification?

A. They do and give off foul odors at the same time, if they are in large numbers. Of course not in small numbers.

986 Q. So that by the determinations of bacteria in the samples of water, that would not identify them in any way, you would not be willing to say that they were in any specific portion maleficent, would you?

A. They were not determined for that purpose. They were de-

termined to show the amount of organic matter and the amount of action which is going on due to that organism.

Q. Would you say that as soon as the bacteria had been determined in any of the samples which have been analyzed—or the samples on which you made the examination for bacteria, would you say they were injurious in the process of disposing of the sewage discharged into the New York Bay?

A. They were not injurious so far as the process of disposing of the sewage was concerned, but they are injurious so far as the production of foul odors and gases and debris and so forth, which is brought about by their action, and in some of the samples that is very evident.

Q. That consequence is what you term purification is it not?

A. It is.

Q. And the destruction and elimination of organic impurities in water may be performed, accomplished, by the exercise of the activities of these bacteria, aided by the oxygen, without putrefication?

A. It may, if the organic matter is not too high.

Q. And so long as the oxygen in the water appears to be reasonably normal, is it or is it not an evidence that the organic matter is not too plentiful?

A. What do you mean by reasonably normal.

Mr. O'Sullivan: I object to the question on the ground that it is ambiguous.

Mr. Riker: Is it because of the word "reasonable"?

987 Doctor, I am not a scientist. I do not pretend to be. I know you are, and I am not.

Mr. O'Sullivan: That is not my point. I simply do not want you to mislead the witness. You are using a term that he is not familiar with.

Mr. Riker: He is a scientist and I am not. If he can be misled by my use of the language, I am rather proud of my ability to mislead. Strike out the word "reasonable."

The Witness: If the oxygen in the water were normal, there would be no occasion for complaint. You have pointed out one case where it is normal out of the entire number in the Harbor.

Q. That might be true even though there were bacteria in the water at that time?

A. Yes.

Q. And it might be true even——

A. If there were not too many.

Q. Even if there were B. Coli in the water?

A. If not in too large numbers.

Q. You testified before the Harbor Board, did you not?

A. Yes.

Q. And you went over all this ground before the Harbor Board?

A. No sir.

Q. What part did you not go over?

A. I did not go over any of it so far as I know, the contents of these books.

Q. None of these tests at all?

A. I think not. I may have made some general observations, depending on these tests, I am not sure of that even.

Mr. O'Sullivan: Counsel for complainants offers to produce Complainants' Exhibit No. 1 to facilitate the examination as to what this witness testified to before the Harbor Line Board.

Mr. Riker: That has been offered in evidence, I suppose.

988 Mr. O'Sullivan: I will bring it here.

Mr. Riker: I assume that having been offered in evidence, it is open to inspection.

Mr. O'Sullivan: I have not it *it* here, but I will produce it immediately if you desire it.

Q. Now, can you state, Doctor, how much exhaustion of free oxygen in the waters of the Harbor or the Bay below the normal will indicate an overflowing of the water with polluted or polluting organic matter?

A. There is a very great difference of opinion as to what percentage can be allowed.

Q. Have you any opinion?

—. I should say that it ought not to go beyond 50 to 75 per cent.

Q. Not below?

A. Not beyond 50 per cent. That is a very low limit.

Q. That is it should not be less than 50 in the water in order to preserve reasonable conditions?

A. Many place it at 75. It is a difficult thing to determine.

Q. At what point in the water with reference to the surface did you place your requirement of 50 to 75 per cent?

A. That should be the general—well, we will say 5 feet below the surface.

Q. 5 feet below the surface?

A. Yes, five feet below the surface.

Q. Would the depth at which sewage might be discharged below the surface have any effect in your judgment upon the quantity of free oxygen requisite to take care of it?

A. Not in salt water, no.

Q. Not in salt water?

A. It might in fresh in the same temperature.

Q. Why do you distinguish between salt and fresh water?

989 A. Because of the difference in the specific gravity. The sewage floats largely near the surface.

Q. In salt water?

A. Even when it is discharged at a considerable distance below.

Q. In salt water?

A. In salt water, yes.

Q. You are an expert on sewage disposal, I understand?

A. I am.

Q. Is it not a practice where it is desired to secure as safe con-

ditions as possible, to discharge the sewage as low in the water as possible?

A. That has been done with the idea of getting greater dilution but it has not been very effective. In fact it has had practically no effect. The water comes up as if in a tube and spreads over the surface.

Q. Where have you observed that?

A. In Boston Harbor.

Q. At what depth is the sewage discharged into the waters of Boston Harbor?

A. I should say about 20 feet.

Q. Are you sure of that?

A. That is at one point. It is discharged at 3 points. At one point it is discharged at the surface; at two other points it is discharged at a depth.

Q. What is the second depth?

A. I would not put it in feet. I would not put it in figures.

Q. Do you remember whether or not it is 9 feet?

A. I would not state the figures. I know it is considerably below the surface.

Q. And the third you think is 20 feet?

A. I think so.

Q. Do you know whether the discharge is horizontal or vertical?

A. The discharge is vertical.

Q. Discharged vertically?

A. Yes, in two cases, and horizontal in the other.

Q. Which one is that?

A. The surface discharge is horizontal. So far as I know
990 there are no other places where any sort of comparison could be made of that effect.

Q. Do you know about the discharge of sewage into Hamburg Harbor?

A. No, sir.

Q. You do not know whether or not that is a place where a comparison can be made?

A. No, I said so far as I know.

Q. Under what pressure is the sewage dicharged into Boston Harbor, at a depth of 20 feet?

A. That I am not prepared to state.

Q. The question of whether it would come rapidly to the surface or would be widely diffused, would depend somewhat on the pressure at which it was discharged vertically?

A. To some extent, yes.

Q. I think you said that was the only other instance that you knew of?

A. Yes, sir.

Q. Did you know that the Bronx Sewer was specified to be discharged at a certain depth below the surface?

A. Yes, sir.

Q. What was the depth?

A. I do not know.

Q. Do you know whether it is actually discharging at that depth?
A. I could not say.

Redirect examination by Mr. O'Sullivan:

Q. I direct your attention to Table No. 14, page No. 29, Complainants' Exhibit No. 3, and specifically direct your attention to Map No. 72 on which Mr. Riker examined you.

Mr. Riker: I did not examine him on the map.
Mr. O'Sullivan: I said map number. I am indicating it by the map number.

Q. (Continuing:) At which you took a sample. Look at the table if you will, Doctor?
A. I have the table here.
Q. I will ask you at what hour of the day you took that sample?
A. The sample was taken at 12.10.

Q. I now ask you at what hour there was high water at
991 Governors Island on that day?

A. At 12.05. In other words the conditions were at the greatest amount of flood at that time.

Q. What significance does that have, the greatest amount of flood?

Q. Whatever dilution it would get from the salt water would be the greatest at that time from the inflow of the waters through the Narrows at that point.

Q. At the very time at which you took this sample there would be the largest possible amount of salt water at that time under the conditions?
A. I should say so, yes.
Q. Is there any doubt about it?
A. No, there are differences due to winds and floods, but in a general way so far as the tidal currents go, that would be the highest point.

Q. Still confining your attention to Table No. 14 on page No. 29 of Complainants' Exhibit No. 3, I ask you to look at the item under Map No. 81, being the last item where you took a sample from the same location, and ask you when that sample was taken?
A. That sample was taken at 3.40 on the ebb of the tide.
Q. Both of those samples were taken on the same day?
A. On the same day.
Q. How do they differ as to quantity of oxygen?
A. You mean in cubic centimeters per liter, or in percentage?
Q. Figure it out in percentage, as you did the other one?
A. In cubic centimeters per liter, they vary from 738 to 919.
Q. How does that figure in percentage, such as you figured out for Mr. Riker?
A. I will have to go back and get the difference of chlorine, and three or four other variations.
Q. Give me an approximation?

A. I could not tell you without getting the difference in
992 chlorine between the two. That saturation of water is at 10,500 chlorine, whereas the other water has much less chlorine. In a general way, however, it is the difference between 7.38 and 9.92. There is a little more difference than that if you figure it out, due to the fact that one is more saline than the other.

Q. Was it within the range of possibility that you had got at that sample in Map No. 72, that you had there a complete sample of sea water unadulterated. Is that within the range of scientific possibility under the conditions under which you obtained this sample?

A. It is possible. It would be very rare. There are streaks of water that might occur of that kind.

Q. What do you mean by the under-run?

A. The difference is due to the fact that at the flood of the tide the amount *or* organic matter at that point is very considerably less than on the ebb of the tide when it is coming down from above, and the water coming from above to that point, is much more highly polluted than the water coming in from the Narrows to that point.

Q. Does not the incoming sea water push the polluted land water and brackish water up stream?

A. It does to a certain extent, yes, very materially; the water from that point would flow up to the end of Manhattan Island during the flood at the surface to some extent.

Q. Mr. Riker asked you as to the differences in temperature, and as to the amount of dissolved oxygen under certain temperatures. I ask you, Doctor, if that is not one of the ways of making an absolute determination of the amount of oxygen in a given sample of water, by raising the temperature of water high enough to drive off all the oxygen?

A. Yes, you can get zero if you raise water to the boiling point.

Q. Drives it all off?

A. That is known in——

Q. In chemistry as the boiling out method?

A. Yes, sir.

993 Q. In determining the variations of oxygen dissolved in water, do you take the temperature and the degree of salinity and the atmospheric pressure into consideration in determining the range of variation?

A. The atmospheric pressure is not usually taken into account; the other points are. As to atmospheric pressure, the difference would be small within the limits of any one examination.

Q. Does that affect altitude; would water taken on one of the mountain peaks of the Rockies—would it have the same percentage of oxygen dissolved in it, where the atmospheric pressure is low, that it would at sea level?

A. Probably not quite the same.

Q. And Mr. Riker asked you about the presence of bacteria. Will you describe the action of the two types of bacteria that act on organic matter in water, those being known as the aerobic and anaerobic?

A. The aerobic bacteria act only in the presence of oxygen and feed on the organic matter and break it down and change it to mineral form. The anaerobic, what we call obligate, grow only in the absence of oxygen, and in their breaking down and feeding on organic matter give off very foul odors. There is another group in between the two to which B. Coli belongs, and in fact, to which some of the other intestinal germs belong, which can grow equally well in the presence or absence of oxygen. In one case the organic matter is becoming thoroughly oxidized, and in the other case it is not, and is breaking down to form substance of disagreeable odor and appearance.

Q. Is it a fact, Doctor, that each of the bacteria coming under these groupings aerobic and anaerobic resolve organic matter into simpler elements?

A. Yes, sir.

Q. And that the difference in the acticities of the two different groups, which I have named is determined by the amount
994 of oxygen in the water, as to whether it will be a nuisance or not?

A. It is determined by the presence or absence of the oxygen.

Q. You stated that 50 per cent. would be a low percentage of oxygen in water. Do you know if major fish life will live in that percentage of oxygenated water?

A. I have not made a study of that.

Q. Do you know that they have found as high as 37 per cent. of oxygen in the Passaic River, that was complained of?

Mr. Riker: I object to the question; it has no relevancy.

Mr. O'Sullivan: You brought these matters out yourself.

Mr. Riker: I did not bring out anything in regard to the Passaic River.

Q. What is the more common name for the precipitated matter that you described?

A. Sludge.

Q. And that carries with it when it is precipitated the bacterial life that is in the organic matter that has been precipitated, does it not?

A. Yes, sir.

Q. Mr. Riker stated that your special line of work was in potable waters?

Mr. Riker: I asked him if it was.

Mr. O'Sullivan: All right; Mr. Riker asked you by the way of question if your special line of work was not confined to potable waters. What do you have to determine in your examinations of potable waters?

The Witness: In the sanitary supervision of the New York Water Sheds, we have quite a considerable number of sewage disposal plants of small villages and large industries which have to be examined for raw sewage and effluents to determine the degree of perifica-

tion which these sewages are undergoing. I have also spent
995 a considerable length of time with Mr. Eddy of the Worcester Sewage Disposal Plant, where I spent four months working on nothing but Sewage, the effluents and experiments in oxygen.

Q. What do you mean by sewage effluents?

A. The purified sewage after leaving the plant.

Q. The disposal works?

A. The disposal plant may be purified or unpurified, depends on its nature.

Q. Is it not a fact that most potable waters are to some extent contaminated by sewage, whether from human beings or other warm blooded animals, taking sewage as representing the excreta from animal life?

A. Why, the waters of most cities and town- which have surface supplies where the water is drawn from surface sources, are to some extent contaminated with drainage, and occasionally with the excreta of other animals than man. I say the excreta of other animals than man, birds, and so forth.

Q. For what purpose do you subject potable waters to chemical analysis.

Mr. Riker: I object to the question as not cross examination. It is not relevant at all to the question under consideration.

Mr. O'Sullivan: You brought it out, Mr. Riker. (Question repeated by the stenographer.)

A. To determine the presence of contaminating matters and the tests which are used are practically the same as those used for sewage. The amounts which would be obtained, of course, would vary with the material. The presence of contamination is determined by the tests for bacteria and the tests for B. Coli.

Q. Following along the line of your special work, as indicated by Mr. Riker, as being confined to potable waters, I ask if you give any special attention in your line of work to the examination of sewage and sewage effluents?

996 Mr. Riker: I object to the question on the ground that it contains a misstatement of the record.

The Commissioner: Note the objection.

A. Do you mean recently?

Q. At any time previous to your testifying today?

A. When I was a chemist and at one time biologist of the Massachusetts State Board of Health, I did quite a considerable amount of special work on sewages and sewage effluents and during my investigations in Worcester, I also experimented on those points, and I have since then from time to time investigated the questions of dissolved oxygen in and the purifibility of sewage and sewage effluents in the regular line of my usual work.

Mr. O'Sullivan: I think that is all.

Mr. Riker: The hour has arrived and passed for adjournment, but I have a few questions I would like to ask the Doctor. Of

course, if counsel and the Commissioner would rather have him come on Monday, very well, but Monday is a long way off.

The Commissioner: You might as well finish now.

Recross-examination by Mr. Riker:

Q. You made an explanation, Doctor, in answer to Dr. O'Sullivan's question with reference to the oxygen found in Sample No. 72, with reference to the condition of the tide, did you not?

A. Yes, sir.

Q. Well, I draw your attention to Sample No. 69 on the same page in the same column, taken apparently at 11.12 o'clock of the same day, is that the right time?

A. Yes, sir.

Q. That shows less oxygen at that point than at Robbins Reef, does it not?

A. It shows you mean less than at what time?

Q. Than at 12.10 at Robbins Reef?

997 A. It does so far as cubic centimeters per liter goes, yes. That is more saline you have to remember.

Q. How much nearer the ocean is that?

A. Very considerably nearer.

Q. How does the flood tide then in your judgment account for the larger amount of oxygen at Robbins Reef at 12.10. Do you think the flood tide has pushed the more highly oxygenated water up the Bay to Robbins Reef, is that the explanation?

A. I should say that at that point, it receives very little sewage.

Q. Receives very little sewage, that is not a question of flood tide?

A. To some extent.

Q. Where did the water come from that was so highly oxygenated in your judgment; did it come from down in the Narrows?

A. Partially so.

Q. Have you any sample which indicates any such highly oxygenated water in the Narrows on that day, look at Table 29?

A. You cannot compare those figures directly. You have got to compare them in conjunction with their salinity. There is no way of answering those questions until you do.

Q. Do you account for it in any way as the probable result of the under-run at that point?

A. No.

Q. The under-run would not fill within 5 feet of the surface would it; would it properly be called an under-run?

A. No.

Redirect examination by Mr. O'Sullivan:

Q. Doctor, I direct your attention to the item that Mr. Riker has just examined you on indicated in Table No. 14 on page 29 of Complainants' Exhibit No. 3, Map No. 69, I ask you again at what time there was high flood at Governors Island?

A. 12.05 P. M.

998 Q. And you took the sample at the Narrows opposite Fort Hamilton, almost an hour before the flood tide, did you not?

A. Yes, sir.

Q. And you took the sample at Robbins Reef five minutes after flood tide?

A. Yes, sir.

Q. Did those facts have any probable influence on the conditions revealed in your analysis?

A. They may have. There are quite a good many factors which enter into those figures. It is difficult to say just which had its effect. In spite of all that the fact remains that in a general way there is about 75 per cent. oxygen in the Narrows and 55 per cent. in the Harbor. That is if you are taking the figures right through. If you pick out individual figures you will get all sorts of results.

At 4.30 P. M. adjourned to November 27th, 1911, at 10.30 A. M.

999 Supreme Court of the United States, November Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY AND PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK CITY,
November 27th, 1911—10:30 A. M.

Before James D. Maher, Esq., Commissioner.

Appearances:

Dr. William J. O'Sullivan, Special Counsel for The People of the State of New York, Complainants.

Joseph Coult, Esq., and Adrian Riker, Esq., of Counsel for the Passaic Valley Sewerage Commission, Defendants.

P. SCHUYLER MILLER, a witness called on behalf of Complainants, and being first duly sworn, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. What is your vocation or business, Mr. Miller?

A. I am a consulting chemist and analyst.

1000 Q. And your office is where?

A. 23 Park Row New York City.

Q. Where did you study and graduate from?

A. I graduated from the Rensselaer Polytechnic Institute at Troy.

Q. With what degree?

A. With the degree of Bachelor of Science, in the four year course in chemical engineering, class of 1897.

Q. Mr. Miller, have you made a specialty of any particular line of work?

A. Throughout my college course and my professional practice since I have devoted most of my time to the study of water, analy-

sis of water and sewage, and the work immediately connected therewith, both in the chemical and bacteriological way.

Q. Have you ever been connected with the Department of Water Supply, and if so, state in what capacity?

A. I entered the Department of Water Supply, New York City, on the first of January, 1898, and remained with that Department until some time in August, 1906. During that time I occupied the position of principal assistant chemist—the position of principal assistant chemist,—at times acting as chief chemist.

Q. Were you connected with the Metropolitan Sewerage Commission at any time?

A. I was.

Q. When did you commence work with them?

A. I commenced work with them, the Metropolitan Sewerage Commission on the first of April, 1907.

Q. And how long did your connection last?

A. Until some time in November of that same year.

Q. Were you connected with the Department of Health, and if so, state if what capacity?

A. I was connected with the Department of Health of New York City from the first of February, 1908 for a year, or a year and a half, I do not remember exactly the length of the period.

1001 My work was principally in connection with the analysis of water and milk. When I first entered the Department of Health, I was placed in charge of the water room, later in charge of the Milk Department, and such criminal work as might be assigned from the Police Department, and then in the latter part of my official connection with the Department of Health I was placed in charge of the water room with court work on milk cases only.

Q. When did you sever your connection with the Department of Health?

A. I think it was in January of 1910; I am not positive.

Q. Did you ever have any connection with the Consolidated Gas Company, and if so, in what capacity?

A. I resigned from the Department of Health in order to accept a position under Dr. Elliot, who at that time,—Dr. Arthur H. Elliot,—was chief chemist of the Consolidated Gas Company, and I remained as his personal assistant until he retired from active service. A period covering about a year and a half as near as I recollect.

Q. What were the next connections that you made, Doctor?

A. I then made business connections with former associates, former assistants of mine and devoted my entire time to private practice.

Q. With an office where?

A. At 23 Park Row.

Q. Where you are now?

A. Where I am now.

Q. Did you devote any considerable part of your professional career to the examination of waters and sewage?

A. During my college term and for ten years after, I probably

devoted 75 per cent. of my time to work on water and sewage. Since then, perhaps 30 per cent. as an average.

Q. And what kind of chemical work did you do in relation to waters and sewages?

1902 A. My work includes all of the determinations which are prescribed or have been suggested by water experts within the last twenty years. I probably have practiced all of them, all of the different methods. I have examined a great many samples from New York and its vicinity, as well as places outside of New York in the private practice which I carried on in addition to my public duties and also outside samples in connection with public work, which is of course, a matter of public record.

Q. Has any part of your work been embodied in the report of the commission on additional water supply?

A. Yes. Tables embodied in the report of that department of the commission on additional water supply, published in 1903. Those tables which were embodied in this report were gotten together under the immediate direction of Mr. Whipple, and comprise a great deal of my work, a great deal of my personal analytical work for the years preceding that, that is from 1897 up to 1903.

Q. Have you got a copy of that report with you?

A. I have. There is a copy on the end of the table, the large volume.

Q. Will you indicate a few of the pages on which your work appears in that volume, first stating what the volume is.

(Counsel hands volume to witness.)

A. This is the report of the commission on additional water supply for the City of New York.

Q. Issued when?

A. Issued on November 30th, 1903, printed in 1904.

Mr. Riker: I object to that part of the question which calls for a reference to this book, on the ground that it has not been proved for the purpose of making it an exhibit, and it is evidently not original memoranda, which are competent to refresh this witness' memory.

The Commissioner: Note the objection. Go ahead.

1903 The Witness: I find on page 520 of the report of the commission on additional water supply of 1903, in Table No. 21, a number of analyses which were made by me and which have been since copied, the material used, by the committee which prepared the report on sewage of the Bay Pollution Commission. The figures as given on page 520, Table 21, are——

Mr. Riker: Pardon me. Before you go on, I would like to ask a question or two in regard to it.

Mr. O'Sullivan: I have not offered that page yet.

Mr. Riker: I thought you were going to read it into the record. If not, all right.

Mr. O'Sullivan: I want simply to identify the page on which his work appears.

Q. Just simply give the pages, Mr. Miller?

A. I have mentioned page 520 as one upon which appears work which seems to be particularly applicable.

Q. That is not the point. I just want to get at these pages, the pages on which your work appear?

A. The pages which cover my work——

Mr. Riker: All the pages of that book would cover his work. I object to the question on the ground that it is irrelevant unless it is connected with this case.

Mr. O'Sullivan: I will connect it later, Mr. Riker.

The Witness: Pages 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360.

Q. Well, there are others, are there?

A. There are others.

1004 Q. That is sufficient. I am merely using this to qualify you. Dr. Miller, did you aid in collaboration with others in furnishing standards for the American Public Health Association?

A. I did, in collaboration with Mr. G. C. Whipple and Dr. D. D. Jackson.

Q. George C. Whipple?

A. George C. Whipple, during my work, during the continuance of my office at the Mount Prospect Laboratory Department of Water Supply.

Q. And those methods are still prescribed by the American Public Health Association?

A. They are.

Q. And in use?

A. And in use, in general use among water analysts.

Q. During your employment by the Metropolitan Sewerage Commission did you personally examine any samples of sewage?

A. I did.

Q. About how many, do you recall?

A. Personally examined about 556 samples of mud during my connection with the Metropolitan Sewerage Commission.

Q. Did you examine any samples of our harbor waters?

A. I did, about 645 samples.

Q. In addition to examining these various samples of mud and water, did you otherwise occupy yourself in establishing any standards for others as to re-agents?

A. I prepared for the laboratory of the Metropolitan Sewerage Commission a full set of standard re-agents covering all of the determinations which they might possibly be called upon to make in their examination of either water or sewage, and checked these standards with those of other laboratories which were pursuing that class of work. In addition, I frequently took samples, collected samples, and also had charge of some float observations in the Upper and

Lower Harbor, combining my float observations, with the opportunity to take samples at the same time.

1005 Q. Now, in addition to the Laboratory work that you have described, did you ever go with any one employed by the Metropolitan Sewerage Commission on a tour of Inspection, and for the purpose of securing samples?

A. Quite frequently I did.

Q. With whom?

A. With Doctor Payn Parsons, who was the bacteriologist of the Metropolitan Sewerage Commission, during the period during which I was employed as chemist and with Mr. Merritt of Tarrytown, who was the engineer of the Commission at that time.

Q. What is Mr. Merritt's full name, do you remember?

A. I think it is D. S. Merritt.

Q. During these tours of inspection of the harbor waters did you secure samples?

A. I did.

Q. Of what?

A. Samples of water, of mud, sometimes both, usually both.

Q. Did you ever go alone collecting samples of both mud and water from the Harbor waters, and from the bottom of the Harbor?

A. I did.

Q. Did you ever make any lines of connections with a view to making a cross section examination of the Harbor waters at any points?

A. I did.

Q. For what purpose?

A. For the determination of salinity during the flow of the tide, at different depths.

Q. In locating the areas that you selected these water and mud samples from, did you ever use any instrument to effect the location with a fair measure of accuracy?

A. I did.

Q. What instrument?

A. A sextant.

Q. And is that a proper instrument for determining locations on water?

A. It is so considered.

Q. You say you were connected with some of the float observations, from where?

A. From Robbin's Reef.

Q. To whom did you report the result of such work as
1006 you have described for the Metropolitan Sewerage Commission?

A. My reports were also made to Mr. Andrew J. Provo[illegible] Secretary of the Commission at the time at which I was connected with it.

Q. In making these reports were there any methods adopted [illegible] their identification?

A. The method adopted for identification was the use of serial numbers only, the serial numbers connecting the sample.

Q. Now, Dr. Miller, I want to confine your testimony to-day to

such parts of the work that you have described as you did for the New York Bay Pollution Commission, and I hand you Complainants' Exhibit No. 2 and ask you if you find in that published report any parts of the tables that are therein set forth as being your work?

A. I can; shall I designate them?

Q. If you please, Doctor, giving the page and the number of the table?

A. On page No. 59 of Complainants' Exhibit No. 2, table No. 6, the third analysis.

Q. Read it?

A. Atlantic Ocean, three miles southeast of Sandy Hook Lightship. Sample taken on the 27th of February, 1903. Free ammonia, should be .064 instead of 0.64, a printer's error, I should judge. The albuminoid ammonia is correct .076. In addition to that chlorine determination was made on this sample with the result of 16,250 parts per million. This sample was examined by me personally.

Q. Have you compared the table that you are now indicating in Complainants' Exhibit No. 2 at page 59 with your original notes?

A. I have compared the original notes which are on file in the Department of Water Supply in my own handwriting, and find the figures there correct, with the difference as stated.

Q. How is that indicated on the files of the Mount Prospect Laboratory?

A. That is indicated by a serial number, the number being 18483.

1007 Q. Now take the next table, Doctor. Does that comprise the entire work that you did in relation to Table No. 6 at page 59 of Complainants' Exhibit No. 2?

A. That comprises all of the work which I am positive of personally being connected with in that table.

Q. And you found the records in your own handwriting?

A. I found the records in my own handwriting in the original books of the Water Department.

Mr. Coult: On that one?

The Witness: As to that one particular sample.

Mr. Coult: How many miles off Sandy Hook?

The Witness: Three miles southeast of Sandy Hook. On page 59 of the same report, Complainants' exhibit No. 2, Table No. 7, I find that I analyzed, made the determination of all of the unnumbered samples. That is all except the first three samples of that table.

Q. Which have map numbers?

A. Which have map numbers. All of the unnumbered samples were examined by me personally in that table.

Q. Will you state where you secured the samples, state also the condition of the tide, the date and give the amount of free ammonia, albuminoid ammonia and chlorine that you determined in the samples that you say you examined personally?

A. The first sample in Table No. 7 was taken from the Hudson

River 100 feet off shore at 35th street. I may call attention to a printer's error as it appears in the original which I have before me. As it appears in the copy I have before me, which is printed as 30th Street that should be 35th Street, correcting it by my own notes which I have compared with this exhibit. The tide was ebb, the date February 26th, 1903, free ammonia——

1008 Mr. Riker: This witness took this himself, I understand, this sample?

Mr. O'Sullivan: Yes, this is his own work.

The Witness: Free ammonia .168, albuminoid ammonia .164, chlorine 7,200.

The second sample was taken at the Battery about one hundred feet off shore, tide ebb, date February 26th 1903, free ammonia was .140. I may call attention there to a printer's error. It appears in the printed table as .124.

Q. And it should be?

A. I should be .140. The albuminoid ammonia is 152, chlorine 9,800.

Q. Now, Doctor, how are those two samples that you have just testified to identified in the record of the Mount Prospect Laboratory; give the serial number with which they can be identified over there. Just read on first the serial numbers for all those things that you examined on that table No. 7?

A. The serial number for the sample taken from the Hudson River at 35th Street will be found upon the records of the Water Department as 18,472.

Q. You had better give all these numbers now, so that all the samples can be identified by their serial numbers. Just give the serial numbers first?

A. The second sample taken at the Battery is identified as 18,474.

Q. Now the third sample is identified?

A. The third sample is 18,475. The sample at Robbins Reef is 18,476. I think the two samples on the record are comprised under that serial number. The sample at the Narrows will be found recorded as 18,478. The first one 18,478, and the second one is 18,477. Rockaway Bell Buoy sample is 18,480. The west West Bank Light Sample is 18,479. The Sandy Hook Light sample is 18,481. The West Bank Light sample is 18,479. The Sandy Hook Light sample is 18,481, and the last sample opposite Sandy Hook Light is 18,482. Those results will all be found adjacent in the original records.

1009 Mr. Riker: Do I understand by a reference to these numbers that you are going to produce the original?

Mr. O'Sullivan: They will not let the originals go out of their possession. They are intermingled with a lot of other work, just like a day book.

Mr. Riker: What is the purpose of putting in the numbers?

Mr. O'Sullivan: So that if any one has the curiosity to verify what he is testifying to, he can go there and consult these records.

Q. Where did you get the samples, the next sample, Doctor, where did you secure that?

A. The next sample at the Battery, floodtide, taken on the 27th of February 1903, free ammonia .124 instead of .144 as it appears printed. The albuminoid ammonia is .180, and chlorine 8150. This sample was taken as near as possible at the same point off the Battery as the previous sample, the one immediately preceding.

Q. Being about how many feet?

A. Being about 100 feet?

Q. Where was the next sample?

A. The next sample was taken near Robbins Reef at ebb tide, February 26th, 1903. Free ammonia was .144 instead of .084 as printed. The albuminoid ammonia was .140 and the chlorine 11,225. The next sample was taken at approximately the same point.

Q. State where?

A. Robbins Reef on the flood tide, February 27th, 1903. The free ammonia was .124 instead of .170 as printed. The albuminoid ammonia was .260 and chlorine 11,225. The next sample was taken at the Narrows on the ebb tide the 26th of February 1903. Free ammonia .132, albuminoid ammonia .112, chlorine, 11,950. The next sample was taken at the Narrows at approximately the same point on the flood tide February 27th, 1903, free ammonia .144, albuminoid ammonia .180, chlorine 9,800.

The next sample was taken at the Rockaway Bell Buoy on the flood tide, February 27th, 1903, the free ammonia was .096,
1010 the albuminoid ammonia .088 and the chlorine 14,850.

The next sample was taken off West Bank Light, the ebb tide February 26th, 1903; free ammonia .128, albuminoid ammonia .132, chlorine 12,450.

The next sample was taken off Sandy Hook Light on the ebb tide, February 26th, 1903. Free ammonia .052, albuminoid ammonia .104 instead of .092 as printed. Chlorine 14,700.

The next and last sample appearing in the table was taken opposite Sandy Hook Light on the flood tide February 27th, 1903. Free ammonia .072; albuminoid ammonia .108, chlorine 15,300.

Q. Have you compared Table No. 7 as it appears on Page 59 of Complainants' Exhibit No. 2 with the original notes of the chemical analyses?

A. I have.

Q. And found it how?

A. And found it correct with the exception of the errors indicated in my testimony.

Q. Doctor Miller, what other tables did you do work in relation to?

A. On page 62, table 8 B.

Q. Of Complainants' Exhibit No. 2?

A. Of Complainants' Exhibit No. 2. I made all of the analyses with the exception of the last one, at Coney Island Pier.

Q. Now, state the ones you did make and what your determinations were?

A. The first one which I examined, the Atlantic Ocean, three miles east of Sandy Hook Lightship, Sample taken on the 27th of February 1903, on the flood tide. The chlorine was found to be 16,250 parts. I may say that the fourth column as it appears in that table containing the approximate percentage of sea water is an estimation not made by me. I will only read what I actually determined.

Q. Yes.

A. The second sample taken off the Sandy Hook Light, February 26th, 1903, on the ebb tide gave a chlorine contents of 14,700.

Second sample opposite Sandy Hook Light at flood tide,
1011 February 26th, 1903, chlorine content 15,300.

Sample taken at Rockaway Bell Buoy 27th of February 1903, flood tide, chlorine 14,850.

Sample taken at West Bank Light, February 26th, 1903, ebb tide, chlorine was 12,450. That comprises my personal work in connection with that table.

Q. Did you compare Table No. 8B as it appears on Page 62 of Complainants' Exhibit No. 2 with your original notes made of the determinations?

A. I did, and found it to be correct.

Q. Who conducted the chemical determinations for the chlorine in those samples that you have testified to?

A. Those chlorine determinations were all done by me personally.

Q. Now, are there any other parts of tables in this report of the New York Bay Pollution Commission that you did personally?

A. On page 64, Complainants' Exhibit No. 2, Table No. 11, the first sample taken at the Narrows on the 26th of February 1903, at the ebb tide contained chlorine 11,950.

Q. Who made that determination?

A. I made that determination. I also made the next analysis. Sample taken from the Narrows on the 27th of February 1903, at flood tide, chlorine content 9,800.

The third sample from the front of the same table taken off the Battery on the 27th of February 1903, at flood tide, content of chlorine 8,150. That analysis was made by me.

The sample following that taken from the Battery on the 26th of February 1903, ebb tide, chlorine content, 9,800. That examination was made by me.

Mr. Coult: At the Battery?

The Witness: At the Battery.

Q. Then the four unnumbered samples in the determinations for chlorine that are given on Table No. 11, page 64 of Complainants' Exhibit No. 2, were collected and examined by whom?

1012 A. They were examined by me personally, and collected under my direction.

Q. Now what other tables were you connected with Dr. Miller?

A. That is all. That is all the work that I find in Exhibit No. 2.

Q. Complainants' Exhibit No. 2?

A. Complainants' Exhibit No. 2, with which I recollect being personally connected.

Q. Did you read the methods approved by the Public Health Association in making these determinations?

Mr. Riker: I object to the question.

Mr. O'Sullivan: I withdraw the question.

Q. What methods did you adopt in making these determinations?

A. I adopted the methods in use by the Department of Water Supply of New York City at that time.

Mr. O'Sullivan: Your witness.

Cross-examination by Mr. Riker:

Q. When you say that the errors appearing in the printer's copy which you have are printer's errors, does that mean that you examined the copy before it went to the printer?

A. I did not see the galley copy.

Q. I ask you whether you saw the copy as it went to the printer?

A. I did not.

Q. Then why do you say it was a printer's error?

A. Because I have a printed copy before me for comparison and I also had my own original manuscript before me.

Q. Did your manuscript go to the printer?

A. My manuscript must have gone to the printer, probably.

Q. Do you know whether it did or not?

A. I do not.

Q. Why do you say it is a printer's error, a loose way of speaking?

A. A loose way of speaking, presumption.

1013 Q. Now, in the samples which you say you took of the waters of the harbor and of the ocean, you have recently examined the reports of analyses made by you?

A. I have.

Q. How recently?

A. Within a few days.

Q. They are still in existence then?

A. They are still in existence or were within a few days.

Q. Where are they?

A. On file in the Department of Water Supply, Gas & Electricity.

Q. And where is that?

A. The main office of the laboratory is at Mount Prospect Brooklyn. I found the records there.

Q. How did you locate the points at which you took the samples that you have been testifying to. I am now confining my question to that?

—. These were estimated by the eye roughly; roughly estimated.

Q. You did not use a sextant to locate these samples?

A. I did not.

Q. How many are there altogether?
A. How many samples?
Q. Yes.
A. I have not counted them.
Q. Well, you have testified to all there were?
A. Yes, sir.
Q. And they were taken in 1903?
A. Yes, some of these samples, if you compare the tables you will find are duplicate.
Q. In taking the sample, what was your method. Did you do it?
A. The samples were all taken approximately at 1 foot below the surface of the water by the regulation sampling apparatus in use by the Department of Water Supply.
Q. Neither I nor the Supreme Court understand what that is, so if you will describe what that method is, perhaps it will be a little clearer?

1014 A. It Comprises a brass frame carrying a glass bottle of about one gallon capacity. This frame is connected with a cord which enables you to lower it at any convenient depth. And attached to that cord, about one foot or 18 inches above the top of the bottle, is a small line carrying a coiled spring. To the end of this coiled speing is connected a rubber stopper which serves to close the mouth of the bottle. The method of collecting the sample is to lower the cage with its bottle closed to the desired depth for collection, and then with a sudden jerk on the rope the spring is thrown into action, the spring which I referred to, this spring drawing the stopper from the bottle. The bottle then fills and is drawn to the surface, and the laboratory sample taken therefrom. That was the method and the apparatus used in the collection of the samples.

Q. Did you take the temperature of the samples when you took them?
A. The temperature was taken from the bottle, from the bottle as it came up. The temperature taken at the time of collecting, by the insertion of a thermometer in that bottle.
Q. You took the temperature of the samples that you took?
A. It is my habit to take it. I do not remember now whether the temperature was taken on those particular occasions or not.
Q. Did you make any records of it?
A. If I did it will be found on the books.
Q. I do not want to know where it will be found, I want your recollection?
A. I do not recollect as to *to* whether I did or did not.
Q. It is customary?
A. It is customary.
Q. You do not see any record in the printed copy of your record; the supposed printed copy?
A. No, I do not.
Q. Your determinations were for what particular chemical element in the water?

A. Free and albuminoid ammonia and chlorine.

1015 Q. Anything else; the determination of chlorine is another way to express its salinity, is it not?

A. It is.

Q. What was the condition of the flood or flow water of the Hudson River at the time you took any of the samples, if you know; can you give any one instance?

A. The samples were taken with the idea of approximating the time of high tide. That is the maximum flood——

Q. I am not speaking of the tide. I am speaking of the water in the Hudson River. Did you attempt to determine what the flow was at the time you took the samples?

A. I did not.

Mr. Riker: I think that is all.

Re-direct examination by Mr. O'Sullivan:

Q. Let me direct your attention to Table No. 11 appearing on page 64, on Complainants' Exhibit No. 2, and particularly direct your attention to the third last sample as indicated in that table, and ask you if the inversion of figures there requires any expert determination as to whether or not it is clearly a printer's error or not?

A. It seems to me that it is hardly worthy of mention. It seems so apparent, for that reason I did not refer to it.

Q. In indicating the sample taken at the Battery on February 27th, 0319, as printed, instead of 1903, is that an inversion of figures?

A. It was an inversion of figures and was noticed by me. It was so apparent, I did not refer to it.

Q. Directing your attention to Table No. 7, as it appears on page No. 59 of Complainants' Exhibit No. 2, those corrections made there, ma-y of them are inversions of figures, are they not, where the figures applying to the sample are printed underneath as those of another?

A. Usually are.

Q. Clearly a printer's error, is it not?

A. It would appear so to me.

1016 Mr. O'Sullivan: That is all.

Recross-examination by Mr. Riker:

Q. Could not the same errors be made by a transcriber in your opinion, from your original records?

A. My recollection is——

Q. I did not ask you what your recollection is. I am asking you now to answer my question. You say they are clearly printer's errors. I want to know whether the same error could not in your judgment be made by transcribers?

A. It is perfectly conceivable.

Mr. Riker: That is all.
Mr. O'Sullivan: That is all, Doctor, for the present.

DANIEL LEWIS, a witness called on behalf of the complainants, recalled, for further examination, testified as follows:

Direct examination by Mr. O'Sullivan (resumed):

Q. Dr. Lewis, you have been chairman of the New York Bay Pollution Commission?
A. Yes, sir.
Q. And you testified as such in this hearing in September, did you not?
A. I did.
Q. At the time you were appointed by the Governor of this State as Chairman of the New York Bay Pollution Commission, had you any connection with the State Board of Health?
A. I was Commissioner of the State Board of Health at the time.
Q. What official position is that, just describe it?
A. Well, the commissioner has charge of all the affairs of the the State Department of Health.
Q. Speak a little louder, please?
A. It is a single headed commission.
1017 Q. How long had you connection with the State Department of Health?
A. I had been President of the State Board of Health for eight years and then held the office of Commissioner after it was made a single headed commission for four years.
Q. Where did you graduate, Doctor?
A. In medicine?
Q. Well, begin with the educational degrees?
A. Alfred University.
Q. What year?
A. In 1869.
Q. Did you take any other educational degree subsequent to that?
A. I received the degree of Doctor of Philosophy from Alfred.
Q. Before that?
A. Before attending the University?
Q. Doctor, let me make it a little clearer. What was the first educational degree that you received?
A. Bachelor of Arts.
Q. That was in what year?
A. That was in 1869.
Q. Now, next what degree did you take?
A. In 1872, I received the degree of Master of Arts.
Q. What next degree did you take, Doctor?
A. I received the degree of Doctor of Philosophy.
Q. In what year?
A. In 1886.
Q. Now, did you receive any degree in 1902?
A. The degree of Doctor of Laws.

Q. When did you graduate in medicine?
A. In 1871.
Q. Where?
A. In Columbia University, Medical Department.
Q. Were you connected with the Medical Society of the County of New York?
A. Have been a member for a good many years.
Q. Did you hold any official position there?
A. Yes was President of the Medical Society of the County of New York.

1018 Mr. Riker: Is not this all in the record, Doctor?
Mr. O'Sullivan: Well, there is some of it in.
Mr. Riker: I cannot remember to recall distinctly, but I think every word of it is in the record.
Mr. O'Sullivan: No.

Q. Now the New York Bay Pollution Commission after investigating reported to the State Legislature, did it not?
A. It did.
Q. And was part of its recommendation, the creation of another commission?
A. It was.
Q. Did it go so far as to draft a law giving the scope and power to be entrusted to that commission?
A. It did.
Q. What was the name that that new commission was finally known under?
A. The Metropolitan Sewerage Commission.
Q. Were you appointed a member of that Metropolitan Sewerage Commission?
A. I was.
Q. And what official position did you hold in connection with that matter?
A. I was elected the President by the Commission.

Mr. Riker: I think that is in the record.
Mr. O'Sullivan: We have not had a word about the Metropolitan Sewerage Commission.
Mr. Riker: You will find that is all in the record.
Mr. O'Sullivan: Not a word. I have just been clearing up so far as the New York Bay Pollution Commission goes.

Q. Do you recall what circumstances led to the creation of this first Metropolitan Sewerage Commission?

Mr. Riker: I object to the question on the ground that it is immaterial and irrelevant.
1019 The Commissioner: Note the objection.
Mr. Coult: How could he intelligently answer that question without making it an improper question; what circumstances led to the formation of a commission?

Mr. O'Sullivan: I think he can judge. This is a very gifted gentleman.

Mr. Coult: I do not see how he can do it lawfully.

Mr. Riker: Suppose he does, what has it to do with the question of pollution of the harbor?

The Witness: The Metropolitan Sewerage Commission, after recommending the adoption of a law providing for a new commission, finally adopted that law, providing that the Commission should become a New York City Commission instead of a State Commission and vesting the power of appointment in Mayor McClellan.

Q. In the Mayor of the City of New York?

A. Yes, in the Mayor of the City.

Q. Under what act was that Metropolitan Sewerage Commission created?

Mr. Riker: I object on the ground that it is immaterial.

A. In May 1906.

Q. Chapter 639 of the Laws of 1906?

A. Yes.

Q. And when were you appointed on that commission and by whom?

A. I was appointed by Mayor McClellan in June 1906.

Q. Who were the other members of the Commission?

Mr. Riker: I object on the ground that it is immaterial, irrelevant and an improper way of proving the Constitution of the Commission. It is immaterial and irrelevant.

1020 A. Professor O. H. Landreth, George A. Soper, A. J. Provost, Matthew Fleming and Daniel Lewis.

Q. Did you undertake, as Chairman, the organization of that commission?

A. I did.

Mr. Riker: I object to that as immaterial and irrelevant.

The Commissioner: Note the objection.

A. The commission created the organization itself.

Q. State then, Doctor, the organization of the Commission, giving its official headquarters, its laboratory?

Mr. Riker: The question is objected to as immaterial and irrelevant.

The Commissioner: Note the objection.

A. After a number of meetings concerning the general work to be undertaken by the Commission, the commissioners organized. At the first meeting the President was elected and Mr. Provost was elected Secretary. After fully discussing the work to be undertaken it was decided to establish a laboratory for making the analyses which was finally located at the Aquarium Building, where the Department offered the commission free use of rooms for laboratory purposes. A chemist was put in charge of the laboratory and an engineer and chemist, Mr. Merritt, D. S. Merritt, I think.

Q. Do you know where he resides now?

A. In Tarrytown.

Q. Do you know whether he has been sick or well recently?

A. No, I do not. The Commission then arranged for the leasing of a boat to take samples. They consulted with Consulting Engineers and Chemists regarding the scope of the plan of the work. Those that I recall as having been consulted were Dr. W. H. Park of the City Bacteriological Laboratory, Mr. George Whipple and Dr. D. D. Jackson.

Q. Do you remember Mr. Whipple's first name?

A. George.

1021 Q. George W?

A. George S. Whipple, I think.

Q. Is he a partner of Mr. Hazen,—Hazen & Whipple?

A. I suppose that is the same Whipple, yes.

Q. All right, Doctor?

A. Then a staff of assistant chemists in the laboratory were appointed and the work carried on in accordance with the suggestions made by these consultants. After full discussion of the scope and plans undertaken by the full commission. The commission, during my presence on the commission, there were forty-five meetings held for these general discussions, and then the various phases of the work were entrusted to committees to carry out the determinations of the commission. Those committees always reported their work to the full commission at subsequent meetings. A large number of samples of water and of mud from the bottom of the harbor were examined and reported upon.

Q. Who was the Secretary of the Metropolitan Sewerage Commission at that time?

A. Mr. A. J. Provost.

Q. What were his particular duties or functions?

A. He kept the records of the commission and was a member of several of the committees. Chiefly the committee which was designated as the Committee on Harbor work, a general committee.

Q. Were reports made to him by these experts?

A. The reports came to him from the Laboratory, and were by him presented to the commission.

Q. Did I get that name right as Matthew Fleming, one of the commissioners?

A. I assume that is the name. I am not quite certain. Mr. Fleming only remained a member for about two months and he resigned and his place was filled by J. H. Fuertes.

Q. Have I got the names of the experts right, William H. Clark, George C. Whipple and Daniel D. Jackson?

A. Yes, that is right.

1022 Q. Was your commission instructed to confer with any other commission?

A. The law directed us to confer with the New Jersey authorities, who had charge of the proposed construction of the Passaic Valley Sewer.

Q. Did you have any conferences with them?

A. Yes. We had two or three conferences with a part of them.

We had a conference with the full commission in Newark. Went over the question with them.

Mr. Coult: When was that?

The Witness: That was sometime in 1906, I should say.

Mr. Coult: Before the law was passed under which we were operating?

The Witness: No.

Mr. Coult: That was in 1907. This was before our law was in existence.

Mr. O'Sullivan: No discussion, Doctor. Please answer my questions.

Q. As Chairman of the New York Bay Pollution Commission did you have any conferences with any of the New Jersey authorities?

A. I cannot say. I think we did. I am not positive.

Q. Do you remember whether or not as a member of the Metropolitan Sewerage Commission, and Chairman of that commission you had conferences with the New Jersey authorities?

A. Yes.

Q. More than one?

A. Well, one conference with the full commission board, or the commission in Newark, and we met sub-committees some of the commissioners, in our office here for conference.

Q. Who kept the records of these meetings and kept the record of whatever conferences you had?

A. They were kept by the Secretary.

Q. Who was he?

A. A. J. Provost.

Q. How was the work to be done by the commission
1023 apportioned?

A. It was apportioned to these sub-committees.

Q. And the organization of these sub-committees and the work apportioned to them, were parts of the records kept by the Secretary, is that right?

A. By the Secretary, yes.

Mr. O'Sullivan: Your witness.

Mr. Riker: No questions.

ANDREW J. PROVOST, Jr., a witness called on behalf of complainants, and being first duly sworn, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Where do you reside, Mr. Provost?

A. At Richmond Hill, Long Island.

Q. And what is your occupation?

A. A consulting Sanitary Engineer.

Q. With an office where?

A. 39 West 38th Street, New York City.

Q. What training and experience have you had in the business that you are now following in?

A. I received the degree of Civil Engineer from the School of Mines of Columbia University in 1889. I spent the following few months in Europe studying sanitary and water supply questions, and in the fall of 1889, I entered the service of the City of Brooklyn as an Engineer and for the following eight or nine years, I had charge of the construction and design of many large sewerage enterprises in that City.

Q. When it was a city?

A. Yes. Soon after consolidation with the City of New York I entered the Department of Finance as Supervising Engineer for the Comptroller and during a period of five years in that
1024 Department, had supervisory charge of all sewerage improvements in the Boroughs of Brooklyn and Queens. In 1904, I became Engineer to the Borough President of Brooklyn and had supervisory charge of important sewerage enterprises conducted by the City of New York in the Borough of Brooklyn, for the next two or three years.

In 1905, I left the employ of the City to go into private practice. Since that time I have been practicing in the name of Lederle & Provost, Sanitary Experts and Consulting Engineers.

Q. With a laboratory where?

A. 39 West 38th Street, New York City.

Q. What is Dr. Lederle's first name?

—. Ernest J.

Q. Has he any municipal connection at present?

A. He is Commissioner of the Health Department of the City of New York at the present time.

Mr. Riker: Is this reflected glory?

Mr. O'Sullivan: I think the reflection would probably be the other way from the witness to the Health Commissioner.

Mr. Riker: I do not see as it qualifies him as a witness or has any relevancy to the inquiry, and I move that it be stricken out.

The Commissioner: Note the motion.

Q. When were you appointed a member of the Metropolitan Sewerage Commission?

Mr. Riker: You have not asked him yet whether he is a member.

A. June 1906.

Q. By whom were you appointed?

A. Mayor McClellan.

Mr. Riker: I object on the ground that it is immaterial
1025 and irrelevant.

The Commissioner: Note the objection.

Q. When was the Metropolitan Sewerage Commission organized?

Mr. Riker: I object on the ground that it is immaterial and irrelevant.

The Commissioner: Note the objection.

A. Organized on the 26th day of June I think, 1906.

Q. Who was its Chairman?
A. Dr. Daniel Lewis.

Mr. Riker: The same objection. I also object on the ground that this witness appears to be testifying from some memoranda which has not been shown to be competent.
The Commissioner: Note the objection.

Q. What position in the Metropolitan Sewerage Commission was assigned to you Mr. Provost?

Mr. Riker: I object to it on the ground that it is immaterial.

A. I was elected Secretary of the commission.

The Commissioner: Note the objection.

Q. What were your duties as Secretary of the Commission?

Mr. Riker: Same objection.
The Commissioner: Note the objection.

A. My duties included keeping the record of all the minutes of meetings of the commission. I had charge of the office organization and general duties appurtenant to the Secretary of such a body. In addition to that I held other positions in the commission, designations as a committee—on committees for special work that came up from time to time.
Q. Can you tell us how many committees the work was distributed among?

Mr. Riker: The same objection.
The Commissioner: Note the objection.

1026 A. There were numerous committees appointed principally during 1906. I have a record here of twenty-four committees.
Q. What have you just consulted now?
A. I have consulted notes which were made by me, taken from the official minutes of the commission showing the designations of the various committees and the line of their investigations.
Q. When were those notes made?
A. These notes were made shortly after the designations were made by the commission.
Q. That would be in what year?
A. Well, either in 1906 or 1907.
Q. How many of those committees were you on?

Mr. Riker: Same objection.
The Commissioner: Note the objection.

A. 10.
Q. What were the committees to which you were assigned?

Mr. Riker: Same objection.
The Commissioner: Note the objection.

A. The first committee I find assigned to me was on June 29th,

1900, I was a member of the committee to obtain headquarters for the commission.

Q. State, Mr. Provost, the various committees and the functions you had to exercise with relation to each and as to whether or not you had charge of the records kept by these committees?

A. Shall I take these up in order?

Q. Yes.

A. Some *or* more or less important. I find here an assignment on July 6th, 1906, which was assigned to me as a committee of one, for study of the important sewerage projects of New York City. On the same day there was assigned to me as a Committee of one a study of the data on current phenomena in New York Bay and so forth.

On July 30th, 1906, I was appointed a member of a com-
1027 mittee with one other member to confer with the United States Army engineers, with regard to conditions showing important sludge deposits in the harbor of New York, which was called to the attention of the Major by the Army Engineers.

On September 21st, 1906, I was appointed a member of a committee with two other members having charge of the line of investigations to be carried on in New York Harbor in compliance with a portion of Section 2 of the Act authorizing the appointment of the commission which was to determine, as I remember, to determine the present and the future conditions of pollution in the Harbor, Bay and adjacent waters, in the vicinity of New York. That committee laid out a line of work within the limits of its appropriation, and commenced work by making a preliminary report of procedure on October 26th. Numerous other reports were made by that committee and sub-committees during 1906 and during 1907, when the work that was done during my connection with the commission was completed. Under the work of this commission there was first obtained laboratory headquarters and the equipment was installed, and subsequently assistants and experts were employed to carry on the work under the supervision and direction of the Harbor Committee which I have just referred to. On October 5th, 1906, I was appointed a member of a committee of three members to hold a conference with a sub-committee from the New Jersey State Sewerage Commission. That committee followed a joint conference with the Metropolitan Sewerage Commission of New York and the State Sewerage Commission of New Jersey at the invitation of the Secretary of State of New York to the Secretary of State of New Jersey, which was suggested by the Metropolitan Sewerage Commission. The joint meeting of the two commissions was followed by a joint meeting of two sub-committes of the two commissions, of which I was one of the members.

Mr. Riker: I move to strike the answer out as not responsive to the question, immaterial and irrelevant to the issue.

The Commissioner: Note the motion and objection.

1028 The Witness: May the witness ask for information?

Mr. Riker: You have got to correct that question.
Mr. O'Sullivan: No, the question is perfectly correct.
(Question repeated by the stenographer)
Mr. Riker: Very well, the stenographer has read it. I suppose it will stand as he read it.
Mr. O'Sullivan: Yes, sir.

The Witness: On November 10, 1906, I was appointed a member of a committee of two members to confer with the Borough President's Office of the Borough of Queens. On November 14th, 1906, I was appointed a member of a committee with one other member to secure additional appropriations. On November 14th, 1906, I was appointed a member of a committee of two members to obtain the passage through the Board of Aldermen of a resolution relating to the progress of work of the commission, the apparatus.

On December 21st, 1906, I was appointed a member of a committee with one other member to investigate and report to the commission as to the availibility of certain experts to act as consulting analysts for the commission to recommend the employment of such an expert. With regard to the work carried out by me as a member of these various committees, I will say that most of them are of a somewhat minor nature, and that the work was completed within a short time and the report was made to the commission and stands on the minutes of the commission, as to what results were recorded. With regard to the committee on Harbor Work, the work of that Committee lasted through a period of some fifteen months, and the principal
1029 duties were to confer with the other two members of the committee, to lay out a line of laboratory investigation, to confer with the experts, with the assistants in charge of the work, in the field, to visit the work, to visit the laboratories, and to receive daily reports from the subordinates and occasional reports as asked for, from the consulting experts.

Q. Now, Mr. Provost, how did you happen to be accepted as Secretary?

Mr. Riker: I object to it as immaterial.

The Commissioner: Note the objection.

A. I do not know that I can answer that.
Q. Were you elected?
A. I was elected.
Q. Don't you think that is an answer?
A. That is the only answer I can think of.
Q. It is the only answer the question is susceptible of, Mr. Provost?

Mr. Riker: I assumed it was because of his merit.

Q. What was the scope of the work undertaken by the Metropolitan Sewerage Commission?

Mr. Riker: I object to it as immaterial.

A. Chiefly as outlined in a portion of Section 2 of the Act.
Q. What Act?

A. Chapter 639 of the Laws of 1906. It relates to the organization, the election of officers, the securing of headquarters, and furnishings and determination of the scope of the work. The securing of appropriations, the securing of a technical staff, the securing and equipping of a laboratory for chemical, physical and bacteriological investigations. A power boat and crew and equipping it with special apparatus for harbor investigations. Securing
1030 press information as to sewerage projects, and of other sources of pollution of the waters of the States of New York, New Jersey and Connecticut. Seeking determinations by the State of New Jersey of a co-operative body from that State. In the work performed was included the holding of forty-nine commission meetings, sewer committee meetings, conferences with the United States Army Engineering, with the New Jersey Sewerage Commission with the Bronx Valley Sewerage Commission—that should be Sewer Commission. Conferences with representatives of New York Commercial bodies. Conferences with various city officials and boards with reference to prosecution of the commission's work, including the Mayor, the Department of Water Supply, Gas & Electricity, The Department of Sewers, the Department of Health, The Department of Docks and Ferries, the Department of Finance, The Department of Laws, the Street Cleaning Department and the Civil Service.

Q. Go a little easier.

A. The Board of the City Record, the Board of Estimate and Apportionment; The Board of Aldermen; and committees thereof. The New York Zoological Society; The State Commissioner of Health; the State Engineer and Supervisor and so forth. The work also included inspections and examinations made by members of the Commission, inspections of the harbors and shores at various points from boats, inspections of drainage operations, and matters in relation to channel improvement. Inspections of harbor pollutions of the New Jersey and Long Island shores, fifty miles south and east. Examination of the plans for the Bronx Valley Sewer; examination of the Act creating the Passaic Valley Sewer Commission and so forth. The work included lines of work to be undertaken and investigations and studies over considerable extent of territory, that were to engage the commissioners' attention. The study of
1031 existing data relating to authentic observations as to current, tidal displacements, and other similar phenomena in New York Bay and adjacent waters. The investigation of proposed large sewerage projects in New York City and adjacent territory. Investigations as to the effect of dumping at sea New York City garbage under various conditions of wind and location of disposal. The study of existing apparatus available for the work of the commission. The design of apparatus for water sampling and temperature observations and for sounding borings and sampling of harbor deposits, and sterilizing apparatus for same. The work included the chemical, bacteriological and physical examinations of 936 samples of harbor water from different stations, under varying conditions. The study of 705 samples of harbor deposits for the purpose of determining the nature and origin of these materials by chemical bacteriological and

microscopical examinations. It also included a detailed study of the likely conditions of pollution produced by important sewers, such as that at the foot of 49th Street in Brooklyn and of other local nuisances such as the Gowanus Canal, the Wallabout Canal, Newton Creek, the Harlem River, the Kill von Kull, Coney Island Creek and so forth. Also studies of surface tidal currents as determined by various float observations. Also included numerous investigations of the sanitary conditions as given tidal cross sections, such as the Hudson River from the Battery to the New Jersey Shore, from a comparative study under all conditions of tidal and freshet flow, temperature and so forth. Also studies of the nature and extent of oil and petroleum wastes throughout the waters and on the floor of the harbor. The derivation of these materials and their effect upon the assimilation and destruction of sewage wastes. Also studies relating to the suitability of New York Harbor water for sprinkling or flushing city streets.

Q. Now, Mr. Provost, how was the commission organized and what subdivisions of the commission were made so as to cope
1032 with work that you have just now described?

Mr. Riker: I object to it as immaterial and irrelevant.
The Commissioner: Note the objection.

A. Very soon after the appointment of the Commission an organization meeting was held at the office of Mr. Fleming and at that meeting Doctor Daniel Lewis was elected President and A. J. Provost, Jr. Secretary. The other members of the commission at that time were Olin H. Landreth, George A. Soper and Matthew J. Fleming. I think it is Matthew J. Subsequently Mr. James Fuertes was appointed in place of Mr. Fleming resigned. Organizing the field work and the laboratory work and the research work of the commission, that was all done under charge of the committee on harbor work, and the consulting analysts who were employed and consulted at various times, they were Daniel D. Jackson, George C. Whipple and William H. Clark. I think they are entitled to be called Doctors. The general analyst in charge of the laboratory and field work was David S. Merritt, assisted for a time by Eric King. The bacteriologist was Dr. Payn B. Parsons, the chemist was Dr. P. S. Miller. The Commission maintained offices at Room 409 The Whitehall Building, No. 17 Battery Place. The laboratory was installed with equipment on the second floor of the aquarium building, Battery Place, for the purpose of obtaining samples of mud and water and for making float observations, the services of a boat were secured with a suitable crew.

Q. Have you now given the assistants and the subordinates and their organization and their assignments?

A. Have I given it?

Q. Yes.

A. Only I think the titles.

Q. Were you appointed a member of the committee on Harbor work of the Metropolitan Sewerage Commission?

A. I was. It was in October 1906, I think.

1033 Q. Have you given the names of the advisory experts?

A. I have.

Q. Who had the supervision over the work of the assistants and subordinates?

A. The Committee on Harbor work.

Q. Were you a member of that committee?

A. I was a member of that committee, was Chairman of the committee. The other members were Professor Landreth and Dr. Soper.

Q. Have you given a general division and description of the work of these subordinates?

A. Taking up the question of the harbor work first, this related to float observations, sampling the waters, sampling the muds, and locating the stations at which these various observations were made and samples taken. This work was in our charge.

Q. How were those stations located?

A. They were located either by lining up with the street system of the City where the stations were close to land or they were referred to important shore marks. For instance, sextant observations would be taken at the site of the Statute of Liberty, or the World Building, or some mark shown on Land, and by reading the angle, the location was thus determined. That was recorded in a note book and the exact location was afterwards calculated as shown on the chart.

Q. Now, as to the subdivision of the work, the laboratory work?

A. The work performed in the laboratory related chiefly to chemical analyses or examinations, microscopical examinations and physical examinations.

Q. What do you mean by physical examinations, Mr. Provost?

A. Observations of the turbidity of the water is a physical examination. The odor of a sample of mud would be a physical examination. The presence of paper, hairs, foreign matter in a sample of mud, would be a physical examination of it.

1034 Q. Then as I understand by physical examination you mean those things that are apprehended by the sensory organs?

A. That is it.

Q. Color, odor, gross or microscopical appearance?

A. That is it.

Q. That is right?

A. That is right.

Q. What miscellaneous investigations and studies did you conduct in addition to the harbor work proper and the laboratory work that you have just described?

A. It is included under numerous headings, inspections, dumping garbage at sea, important sewerage phenomena, existing tidal currents and tidal discharge observations; the principal local nuisances, the feasibility of using harbor water for sprinkling streets; the distribution of the salinity at different depths and different points, in several different cross sections, showing several tides at

freshet and normal flow of the North River the East River and New York Bay. Studies of the nature and the extent of oil and petroleum wastes throughout its waters and floor of the harbor. Also their effect on the assimilation of sewage wastes.

Q. As a result of those studies, did you make any recommendations to any officials?

A. Yes, there were several recommendations made. One was made to the Mayor for the general adoption of the separate system of sewage for all known important sewage in Greater New York, in order to facilitate ultimate sewage disposal and treatment. A recommendation was later made to the Mayor for action in the interest of the City and State of New York by resisting and endeavoring to defeat House Bill No. 178 introduced in the New Jersey Legislature in February 1907, creating the Passaic Valley Trunk Sewer District and authorizing the construction of the trunk sewer. There were several conferences and hearings held
1035 pursuant to the directions of the Act, and as resulting from the work of the commission. One of these was held with the New Jersey Sewerage Commission and with a committee from the same with respect to co-operative work. There was a conference with the Bronx Valley Sewerage Commission with respect to the desirability of providing treatment works. Conferences with the United States War Department Engineer with respect to the nature and extent of important harbor deposits. There was a hearing before the State Engineer and State Commissioner of Health at which members of the Commission appeared in opposition to the approval of the Bronx Valley Sewer plans in the absence of provision for treatment.

Q. Mr. Provost, will you take up the order of work in the way you have set it forth, first the harbor work and describe the float observations made.

Mr. Riker: Those are the observations?
Mr. O'Sullivan: Yes, sir.

The Witness: I can do it, but not readily without the charts.

(Mr. O'Sullivan produces charts.)

A. The total number of float observations made *number* during the year 1907, 27.

Q. Mr. Provost, please explain how they were made; describe what you mean by float observations, and how you make them before we come to the question of recording them.

A. A float observation is made for the purpose of determining as nearly as possible the travel of a body of water in its natural directions, under the influence of tidal or wind influences. The type of float which was used in these experiments was of the submerged type. It consisted essentially of two cross vanes located at a depth of 5 or 6 feet under the surface of the water. Those vanes were approximately 2 or 3 feet long and perhaps one foot in height.
1036 Those were attached to a small scantling, or pole which reached the serface of the water and carried a small flag,

so that the position of the float on the water might be readily seen and determined at any time. The objects in this particular case were to obtain information as to how far floating material or material floating just below the surface of the waters of this Bay would go during a complete todal phase. And for this purpose the floats were placed in the water at or near the beginning of a tidal phase and were then followed by a boat, a power boat and at frequent intervals the position of the float in the water was observed and recorded. Some of the floats took a direction towards the shore and at time collided with docks or with the shore itself. Some of them grounded. Those floats were all immediately taken out of the water, removed again a short distance out in the stream and set free again and they were followed until dark in order to determine their path of travel. Does that answer your question in general?

Q. Yes, sir. State what your object was in making float experiments. Address yourself to me, Mr. Provost, as if I had never heard of these things?

A. The final disposition of matters cast into the New York Bay is that they either go to the bottom of the Bay and remain there for a period or else they will float continually around in the Bay for an indefinite period, or else they will go to sea and not return. The object of these float experiments were to determine just what would be the disposition of floating material introduced at various points, and certain points were picked out as the initial points and then the floats were followed to determine the final points during that day's observations.

Q. Now, state what you did in relation to these observations?

A. The beginning of this work was on February 23rd 1907.

1037 Mr. Riker: Before he uses that paper I want to examine him in regard to it a little.

Mr. O'Sullivan: All right.

Cross-examination by Mr. Riker:

Q. What is the paper which you are now directing your attention to?

A. This chart? You mean this chart?

Q. Whatever you are looking at and what you propose to testify from?

A. This is a chart which is a copy of a chart made by Mr. Merritt, who was in charge of this work.

Mr. Riker: I object to the use of this on both grounds, that it is not an original, and second that it was not made by this witness.

The Commissioner: Note the objection.

There is to be a meeting of the Finance Committee this afternoon, and they will require the use of the room in which these hearings have been held.

At 1 P. M. an adjournment was taken for noon recess to meet again at 2 P. M. at the Corporation Counsel's Office in the Hall of Records.

Adjourned to 2 P. M.

1038 Corporation Counsel's Office, Hall of Records.

NEW YORK CITY, November 27th, 1911—2 p. m.

ANDREW J. PROVOST JR., a witness called on behalf of complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan (resumed):

Q. Are those the ones; did you take some of them?

A. That is the one. (Counsel hands map to witness.)

Q. Who caused these maps to be made that are now before you, or charts?

A. They were made at the direction of the Harbor Committee of which I was Chairman.

Q. Did you direct the making of these particular maps?

A. I did.

Q. Were they made under your supervision?

A. They were.

Q. Now, describe, Mr. Provost, such float observations as were made under your direction for the Metropolitan Sewerage Commission, giving the dates?

A. The first float observation was made on the 23rd of February 1907, following a long series of water examinations in the vicinity of the sewer outlet at the foot of 49th Street in Brooklyn; at 7 A. M. February 23rd the float was placed in the water in Gowanus Bay near 49th Street sewer outlet. It proceeded in a generally southerly direction and at 7.15 collided with one of the pier heads. It was removed at this point and carried a short distance out into the stream at 8.10 and at 9 o'clock it collided with inshore about what is known as Owls Head. The float was then taken from the water and moved out into the stream and thereafter proceeded in a general southerly direction through the Narrows and into the Lower Bay. At 2.30 P. M. it had proceeded through the lower
1039 end of the Ambrose Channel to about its ocean mouth, and at that time its direction changed directly toward the west and the float was carried back into the Lower Bay towards Princess Bay, inside Sandy Hook. The float was removed from the water at 5.45 P. M.

The second float observation was made on February 25th, 1907. The float was placed about mid-stream of the Hudson River opposite the Battery at 10.15 A. M. Its course was observed to take a general southerly direction through the middle of the Upper Bay and Narrows into the Lower Bay to a point off Norton's Point, Coney Island, which point it reached at 4 P. M. At that time the float changed its course or direction and moved in a generally northerly direction up into the Narrows beyond Fort Hamilton, from which point it was removed from the water at 6 P. M.

The third observation was made on February 26th, 1907. The float was placed in the water in the Upper Bay near the vicinity of Robbins Reef Light, at 10 A. M. this float proceeded in a generally southerly direction through the Upper Bay and Narrows into the

Lower Bay to a point about one and three quarters mile short of the extreme distance contained by float observation on February 23rd, when at 4 P. M. the float turned and took a westerly direction towards Princess Bay, substantially parallel with the course taken by the float observed on February 23rd.

Q. Did you cause the three float observations to be plotted on any map?

A. I caused them to be plotted on this map.

Q. And how do they appear on that map so as to distinguish them?

A. They appear on this map as observations under the dates to which I have testified in the form of green, red and yellow lines.

Q. Green being for which experiment?

A. Representing the experiment of February 23rd, being the first. Red the second observation, that of February 25th; yellow the third observation that of February 26th.

1040 Q. Do you hold that map in your hand that you had those observations plotted on?

A. I hold that map in my hand.

Mr. O'Sullivan: I offer that map in evidence and ask that it be marked Complainants' Exhibit No. 4.

Mr. Riker: I object on the ground that it was not prepared by the witness and has not been properly proved.

The Commissioner: Note the objection.

Marked Complainants' Exhibit No. 4.

Q. Continuing your float observations, Mr. Provost, when did you make the next series of observations?

A. The next float observation was made on March 4th, 1907. This float was placed in the Upper Bay, just north of Robbins Reef Light at 1.30 P. M. The course taken by this float——

Q. On what tide?

A. On the ebb tide.

Q. What tide were the other observations made on?

A. The first three observations were all on the ebb tide.

Q. Now, this observation of March 4th, 1907, on what tide was that made?

A. That was taken on the ebb tide, this float proceeded in a generally southerly direction, in substance the same course as that taken by the float in observation No. 3, to a point about 2½ miles south of Luna Park, Coney Island, *at* which point the float reached at 5.45 P. M. The float was then taken from the water because to was too dark to follow it and before any similar turning had taken place in its direction.

Q. Now, the next float observation?

A. The next float observation occurred on March 5th 1907 on the flood tide. This float was placed in the Upper Bay at a point just north of Robbins Reef Light, substantially identical with the beginning of the last float observation.

1041 Q. That is both the floats were both put in the water approximately at the same point?

A. Yes, and on the ebb tide, one on the ebb tide and the other on the flood tide. This float proceeded in a substantially northerly direction.

Q. When did you put that float in?

A. At 8 o'clock A. M.

Q. On what tide?

A. On the flood tide. This float proceeded in a substantially northerly direction through the Hudson River to a point below 60th Street Manhattan, at which point it reached at 2.45 P. M. At that time the float was deflected slightly to the west, then took a southerly direction on the westerly side of the river. It then came over towards the easterly side of the river and was taken from the water at 5.50 P. M. just above pier No. 25 at Moore Street.

Q. When next did you make any float experiments or observations?

A. The next float observation was made on March 7th 1907. This float was placed in the water of the East River off the Battery at 10.25 A. M. on the flood tide. This float proceeded up the river to a point about the Brooklyn Bridge, where the float collided with the shore. It was removed at 10.50 o'clock to a point out-stream.

Q. A. M. or P. M.?

A. A. M.; and then proceeded up the river over towards the East or Brooklyn shore, where it collided with the shore again about the side of the Williamsburg Bridge. The float was removed from the water and placed in mid-stream approximately and thereafter proceeded in a northerly direction up the East River travelling the west channel, between Blackwell's Island and the Borough of Manhattan, and thereafter the East Channel between Ward's Island and Long Island shore, until 3.40 P. M. at which time the float turned in its direction and proceeded west until it collided with Ward's Island, when it was taken from the water.

1042 Q. When next did you make any observations?

A. An observation was made on March 22nd 1907. This float was placed in the waters off the Narrows.

Q. At what time?

A. About one third the distance from the Brooklyn shore on the flood tide. This float proceeded in a generally northerly direction to a point near Owl's Head where it collided with the Brooklyn shore, at 2.40 o'clock. The float was removed from the water and placed out stream and thereafter followed in a northerly direction along the Brooklyn shore until 4 P. M. when it was taken from the water. These various observations now run on the basis of a yellow line for the observation of March 4th, 1907, and a red line for the observation of March 5th, and a green line for the observation of March 7th and a blue or purple line for the observation of March 22nd.

Q. Did you cause the courses of these floats to be plotted or outlined upon any map?

A. I gave such directions.

Q. And have you got the map with the plotting on it?

A. I have this map in my hands.

Q. That map was prepared under your direction?
A. This map was prepared under my directions.

Mr. O'Sullivan: I offer that map in evidence.
Mr. Riker: I would like to ask some questions on it.

Cross-examination by Mr. Riker:

Q. Is that the original map?
A. I think so. I should like to correct my earlier testimony as to that. My belief is that that is the original map.
Q. Why do you say you think, is there some doubt in your mind?
A. Because I find my initials on it, and I at first confused it with a copy of the map which was made subsequently.
Q. Did you have any part in the actual making of that 1043 map?
A. You mean did I draw the lines on the map?
Q. Yes.
A. I did not.
Q. Were you present when they were drawn?
A. I do not recall as to that.
Q. What data did you furnish to the draughtsmen?
—. The note books of the field observations.
Q. Did you make the note books yourself? The observations in the notebooks?
A. I did not make the observations personally, no, sir.

Mr. Riker: I object to the offer on the ground that it has not been proved to be correct.
Mr. O'Sullivan: I ask that it be marked.
The Commissioner: Note the objection.
Marked Complainants' Exhibit No. 5.

Redirect examination by Mr. O'Sullivan:

Q. There is a number in the left hand corner of that map a number 2?
A. No. 2.
—. Chart No. 2?
A. Chart No. 2.
Q. What other float observations or experiments were conducted by you?
A. The next float observation was made on March 23rd, 1907.
Q. Describe what you did on March 23rd?
A. At 1 P. M. on that date, on the flood tide, a float was placed in the center of the Narrows opposite Fort Hamilton. This float proceeded thereafter in a generally northerly direction swerving somewhat towards Brooklyn shore and at 5 P. M. was taken out close to the Brooklyn shore near Owl's Head.
Q. When next did you make any observation?
A. The next float observation was made on March 25th, 1907. At 9.30 A. M. on that date on ebb tide. The float was placed about

midstream of the Hudson River opposite the Battery, and thereafterwards was observed to proceed in a generally southerly
1044 direction through the Upper Bay to a point near the Brooklyn Shore at Owl's Head and thereafter to proceed in a generally southerly direction along the Brooklyn shore to about the foot of 83rd Street, where the float collided with the shore at about 1 P. M. The float was taken from the water and removed to a point further from the shore and was observed thereafter to proceed in a generally southerly direction along the Brooklyn shore into Gravesend Bay until at 2.35 P. M. when it was about in the center of Gravesend Bay, its course was observed to deflect, at first towards the west, and thereafter to a generally northerly direction, to a point about the center of the Narrows opposite Fort Hamilton, at which point the float was removed from the water at 4.54 P. M.

Q. When did you make the next observation?

A. The next float observation was made on March 27th, 1907 at 9.30 A. M. On the ebb tide the float was placed in the water of Buttermilk Channel between Governors Island and the Brooklyn Shore. It was observed thereafter to take a generally southerly direction through the Upper Bay and the Narrows being deflected towards the Brooklyn shore and nearly touching same at Fort Hamilton Bay. It thereafter was observed to proceed in a general southerly direction across Gravesend Bay, close to Norton's Point, at the end of Coney Island and to a point just south of Sea Gate, and at 3 o'clock the float turned towards the west and started to proceed north. At this time it was taken from the water.

Mr. Coult: At what time?

The Witness: At 3 P. M.

Q. When did you make the next observation Mr. Provost?

A. The next observation was made on March 28th, 1907, at 11 A. M. on that date on the ebb tide, a float was placed in the waters at the mouth of the Kill von Kull. The float was observed to proceed thereafter in first an easterly direction to a point off Tompkinsville, and thereafter to follow the easterly shore
1045 of Staten Island through the Narrows. It was observed thereafter——

Q. Travelling in what direction?

A. In a generally southerly direction. It was observed thereafter to proceed in a generally southerly direction out the Lower Bay to a point—I will change that last, through Ambrose Channel to about the end thereof, until at 3.30 P. M. when the float was observed to deflect towards the west and was at that time removed from the water.

Q. Under your direction were the courses taken by those four floats plotted upon a map?

A. They were.

Q. And how as to color are they distinguished?

A. The observation of March 23, 1907 was shown on the chart as a blue or purple line. The observation of March 25th, 1907 is

shown on the chart as a red line. The observation of March 27th is shown as a green line. The observation of March 28th is shown as a yellow line.

Q. Did you cause these to be plotted on this chart No. 3 that you now hold in your hand?

A. They were so plotted at my direction.

Mr. O'Sullivan: I offer that in evidence and ask that it be marked Complainants' Exhibit No. 6.

Mr. Riker: Was the same course pursued in the preparation of this chart as in Chart No. 2?

The Witness: The same, yes, made in the same manner.

Mr. Riker: The same objection.

The Commissioner: Note the objection.

Marked Complainants' Exhibit No. 6.

Q. Mr. Provost, did you cause any other float observations to be made?

A. The next float observation was made on March 29th 1907; at 10 A. M. of that date a float on the ebb tide, a float was placed in the waters of the East River between Wards Island and the Brooklyn Shore—the float was was observed to take a course from this point southerly and westerly towards the Borough of Manhattan shore and to pass southerly through the westerly channel between Blackwell's Island and the Borough of Manhattan. It was observed thereafter to follow substantially through the center of the East River in a southerly direction and between the Battery and Governors Island to a point in the Upper Bay about opposite the mouth of the Hudson River. From this point the float was observed to take a generally southerly direction, to a point about in the middle of the Narrows. At 4.45 P. M. the float was observed to change its course for a short distance to the west and then to take a northerly direction. The float was then removed from the water at this time.

1046

Q. What time was that?

A. Just after 4.45.

Q. P. M.?

A P. M.

Q. When did you next make any float observations or experiments?

A. The next float observation was made on April 2nd, 1907; at 1.20 P. M. on that date a float was placed in mid-stream in the Hudson River about opposite the Government Ship Canal at Spuyten Duyvil, on the ebb tide. The course of the float was thereafter observed to be in a generally southerly direction through the Hudson River until at 6.20 P. M. when it was opposite Pier No. 15, that is Vesey Street, at which point and time the float was observed to take a westerly direction for a short time and then to turn north, at which point it was taken from the water.

Q. At what hour?

A. Just after 6.20 P. M.

Q. When did you make your next observation, Mr. Provost?

A. The next observation was made on April 3rd, 1907. On this date at 12.45 P. M. a float was placed in the water at Newark Bay, at the Central Railroad of New Jersey Bridge.

1047 Mr. Coult: At what time?

The Witness: At 12.45 P. M. on the ebb tide. The float was thereafter observed on its course through the Kill von Kull until at 3 P. M. when it collided with the Bayonne shore. It was thereupon removed to a point further out-stream, and proceeded thereafter as is shown by the observation, substantially easterly along the shore of Staten Island, and thereafter in a generally southerly course through the Narrows to a point of the Staten Island shore, just above Fort Wadsworth, where it collided with the shore. The float was then removed to a point outshore and was observed thereafter to proceed in a generally southerly direction to a point near Swinburne Island, in the Lower Bay, where at 6.30 P. M. the float was removed from the water.

Q. When did you conduct the next observation or experiment?

A. The next float observation was obtained on April 4, 1907. On this date at 9 A. M. a float was placed in the water of the Narrows about one third of the distance out from the Staten Island shore on the flood tide. The float was observed thereafter to take a generally northerly direction through the Narrows and thereafter a northeasterly, generally a northeasterly direction along the Brooklyn shore to the Gowanus Bay, where at 1:35 P. M. the float was observed to change its direction to a southerly course, and was then removed from the water.

Q. Did you cause the float observations and experiments to be plotted upon the map?

A. I directed that they be so plotted.

Q. And are they now before you in chart No. 4?

A. I have them here before me now, plotted on Chart No. 4.

Mr. O'Sullivan: I offer that in evidence.

Mr. Riker: I would like to ask the witness a few questions.

1048 Recross-examination by Mr. Riker:

Q. Who made the field observations?

A. They were under the direction of Mr. Merritt. He has charge of the field work.

Q. I ask you who made them for this chart, for furnishing the data for this chart, who made them?

A. It takes a number of people usually to make observations of this kind. A man is in charge of a party, one man will hold a watch and another man observe the location of the float and another man record it in the book. It was not the work of any individual.

Q. Who made the field notes themselves?

A. I cannot tell you from memory. The field book was in charge of Mr. Merritt.

Q. Did you make them.

A. I did not. They were made under my directions.
Q. Were you present when they were made?
A. I cannot recall as to that.
Q. Were you present when the map was made?
—. I cannot recall as to that.

Mr. Riker: I object to the offer on the ground that the witness does not appear to know anything about this chart. The making of this chart.

The Commissioner: Note the objection.

Marked Complainants' Exhibit No. 7.

Redirect examination by Mr. O'Sullivan:

Q. On the bottom of that chart No. 4, now marked Complainants' Exhibit No. 7, I see some initials, whose initials are those?
A. Those are my initials, in my handwriting.
Q. Made when?
A. I do not recall when.
Q. Can you give any approximate idea of the time?
A. I judge they were made at the time the maps were submitted to me as chairman of the committee.
Q. When next did you make any observations, Mr. Provost?

Q. I judge they were made at the time the maps were sub-
1049 *mitted to me as chairman of the committee.*
Q. When next did you make any observation, Mr. Provost.

A. The next float observation was made on April 6th, 1907, at 9.30 A. M. On that date a float was placed in the water of the Hudson River at its mouth opposite the Battery at the ebb tide. It was observed thereafter to take a general southerly direction through the Upper Bay, until at 12.30 o'clock, when about opposite Owl's Head the float changed its direction at first to an easterly course and thereafter in a general northerly course into Gowanus Bay, until at 5.10 P. M. it was observed to change its direction to a westerly course at first and thereafter to a southerly course when it was removed from the water.

Q. When were the next observations made?
A. The next float observation was made on April 8th, 1907. At 11.30 A. M. on that date, a float was placed into the water of the Kill von Kull, about one half mile west of its outlet into the New York Bay on the last part of the ebb tide. The float thereafter was observed easterly through the Kill von Kull, to its mouth, where at 12.30 P. M. it was observed to turn in its course and proceed thereafter in a westerly direction through the Kill von Kull, and into Newark Bay, where at 5.30 P. M. the float was about one third of a mile north of the Central Railroad of New Jersey Bridge.

At this time the float was observed to change its direction and to proceed to Kill von Kull. The float was taken from the Newark Bay when it reached the Central Railroad of New Jersey Bridge, the second time.

Q. At what time, what hour?
A. The time is not stated here. It was about 5.30 P. M.

Mr. Coult: When was it started?
The Witness: About 11.30 A. M.

Q. When were the next float observations made?
—. The next float observations was made on April 12th,
1050 1907, at 9 A. M. of that date. On the last of the flood tide.
The float was placed in the waters of the Hudson River at its mouth opposite the Battery. It was observed to float in a northerly direction up the Hudson River to a point about opposite pier 25, at Moore Street, where at 10.45 A. M. it changed its course to a generally southerly direction, into and through the Upper Bay, the Narrows, into the Bay as far as Coney Island Point, where at 3.40 P. M. it changed its course at first easterly and thereafter in a generally northerly direction through the westerly edge of Gravesend Bay to Fort Hamilton, where at 6 o'clock it was taken from the water.

Q. When was the next float observation or experiment made?
A. The next float observation was made on April 13th, 1907, at 7.45 A. M. on that date, on the flood tide. The float was placed in the water of the Lower Bay about the seaward end of the Ambrose Channel, and was observed thereafter to flow in a generally northerly direction through said channel in the Lower New York Bay to the Narrows, to a point in the Narrows about one third of a mile north of Fort Wadsworth, where at 10.45 A. M. it was observed to deflect its course, at first easterly and then to a southerly direction until at 11 A. M. when the float was taken from the water.

Q. Were these float observations as to the courses you have just described, plotted upon a map under your directions?
A. They were plotted on this map under my directions.
Q. Are they distinguished from each other in any particular way, as colored or otherwise?
A. They are. The observation of April 6th is shown on the chart in green, with green lines, the observation of April 8th is shown by red lines, the observation of April 12th is shown by a yellow line, and the observation of April 13th is shown by a blue or purple line.
1051 Q. And what is the number of the chart itself?
A. The chart is numbered 5.

Mr. O'Sullivan: I offer Chart No. 5, which has just been testified to in evidence.
Mr. Riker: A question or two to this witness.

Recross-examination by Mr. Riker:

Q. How much of the matter contained in this chart was furnished by you personally?
A. You mean observations?
Q. Yes.
A. None of those observations were recorded by me personally.

Mr. Riker: I object to the use of the chart, or the offer of the

chart on the ground that it appears to be, so far as this witness is concerned, hearsay.

The Commissioner: Note the objection.

Marked Complainants' Exhibit No. 8.

Redirect examination by Mr. O'Sullivan:

Q. When were the next float observations made Mr. Provost?

A. The next float observation was made on June 26th, 1907, at 11 A. M. on that date, on the ebb tide. A float was placed in the waters of the Upper Bay a short distance east of Robbins Reef Light and was observed thereafter to take a general southerly direction through the Narows and along the easterly shore of Staten Island to a point about three miles south of Fort Wadsworth, where at 2.50 P. M. the float was taken from the water.

Q. When was the next float observation or experiment made?

A. The next float observation was made on July 8th, 1907 at 10.10 A. M. of this date. The float was placed in the waters of the Upper Bay just east of Robbins Reef Light on the ebb tide. The float was observed to take a generally southerly direction until it impinged on a pier head on the East Staten Island shore of the Nar-
1052 rows. The float was removed to a point further out stream, and proceeded thereafter as observed in a generally southerly direction along the shore of Staten Island to Fort Wadsworth and thereafter in a generally southerly direction to a point just east of Hoffman Island, where at 2.15 P. M. the float was observed to change its course to a northerly direction, and it was thereafter observed proceeding in this northerly direction until 4.45 P. M. when the float landed ashore at Staten Island at Fort Wadsworth.

Q. Did you direct the plotting of these two experiments on any chart or map?

A. I directed their being shown on such chart.

Q. What is the number of that chart?

A. Chart No. 6.

Q. How do you distinguish the two experiments that are plotted or described by Chart No. 6?

A. The observations made on June 26th are shown on this chart as in green lines and figures and the observations of July 6th are shown on the chart in red lines and figures.

Mr. O'Sullivan: I offer Chart No. 6 in evidence and ask that it be marked Exhibit No. 9.

Recross-examination by Mr. Riker:

Q. Did you make the observations on which this chart was founded?

A. I directed that the observations be made.

Q. Did you make them personally?

A. Not personally.

Q. Were you present when the map was made?

A. I do not recollect.

Mr. Riker: Same objection as to the last offer.
The Commissioner: Note the objection.
Marked Complainants' Exhibit No. 9.

Redirect examination by Mr. O'Sullivan:

Q. Mr. Provost, when did you next make any float or have float observation or experiment made?

1053 A. The next float observation was made on July 9th, 1907 at 1.30 A. M. of this date. A float was placed in the water of the Upper Bay just northeast of Robbins Reef light on the ebb tide, and it was thereafter observed to proceed in a generally southerly direction through the Upper Bay and the Narrows, and the Lower Bay to the Ambrose Channel, where at 3.05 P. M. it was observed to shift to a more westerly direction and to proceed towards Princess Bay until 5 o'clock P. M. when it was taken from the water.

Q. When were the next float observations or experiments made?

A. The next float observation was made on July 11th, 1907; at 9.45 A. M. of that date a float was placed about mid-stream of the Hudson River at a point just below Glenwood, Yonkers, on the last of the flood tide. It was observed thereafter to take a generally northerly direction until it grounded on the East side of the Hudson near Glenwood. The float was then removed to a point further up stream and observed to continue in a generally northerly course until 12.10 when its position was a short distance above Glenwood. At this time the float was observed to change its direction to a generally southerly course and it was observed to continue in this course until 3 P. M. when, at a point in the Hudson River about opposite Riverdale the float was removed from the water.

Q. When were the next float experiments or observations made?

A. The next float observation was made on July 16th, 1907, at 10.05 A. M. of this date,—a float was placed in the waters of the Upper Bay at about the same point approximately as that of the observation of July 9th, and it was thereafter observed to take a course on the flood tide in a generally northerly direction to a point just north of Bedloe's Island, where it was observed to change its course to a southerly direction, until at 1.30 o'clock P. M.

1054 when it was removed from the water.

Q. Under your directions were the courses you have just described set in outline on this chart or map?

A. They were shown on this chart at my direction.

Q. What chart are you alluding to?

A. Chart No. 7.

Q. And how are the three observations or experiments with floats distinguished on that chart?

A. The observation of July 9th was distinguished on this chart by red lines and figures. The observation of July 11th is distinguished by green lines and figures and the observation of July 16th is distinguished by yellow lines and figures.

Mr. O'Sullivan: I offer Chart No. 7 in evidence and ask that it be marked Complainants' Exhibit No. 10.

Recross-examination by Mr. Riker:

Q. Did you make any of the observations that are supposed to be embodied in this chart?
A. They were not recorded by me personally.
Q. Did you make them?
A. I did not make them.
Q. How do you know they are correct?
A. Because I had confidence in the men who made them.

Mr. Riker: I object to the offer on the ground that it is not proved to represent any facts.
The Commissioner: Note the objection.
Marked Complainants' Exhibit No. 10.

Redirect examination by Mr. O'Sullivan:

Q. When did you next make any float observations or experiments?
A. The next float observation was made on July 17th, 1907; at 10:35 A. M. of that day a float was placed in the waters of the Upper Bay just north of the Robbins Reef Light and on the flood tide and it was observed thereafter to take a generally northerly direction through the Upper Bay and along the easterly shore
1055 of the Hudson River to a point about *about* 14th Street at which point the float was observed to deflect its course towards midstream and thereafter to pursue a generally northerly direction until about 4.30 P. M. when at a point about opposite 30th Street the float was observed to change its course to a southerly direction. The float was at this time taken from the water.
Q. Continue this series?
A. The next observation was made on July 19th, 1907. At 6:20 A. M. of this date on the ebb tide, a float was placed in the Hudson River about midstream and about opposite Ludlow. This float was observed thereafter to take a generally southerly direction through the Hudson River to a point just south of 42nd Street, Manhattan, where at 1.45 P. M. it was observed to deflect its course and to return in a northerly direction. The float was taken from the water at 1.20 P. M.
The next and final float observation of the series of 27 taken in 1907 was on July 22nd, 1907. At 8.05 A. M. of this date a float was placed in the water of the Hudson River on the ebb tide at a point east of the observation—of the start of the observation of July 19th and near the east shore of the Hudson River at Ludlow. This float was observed thereafter to take a generally southerly direction along the Westchester shore until it reached Spuyten Duyvil, at which point it made a loop and thereafter proceeded in a generally southerly direction until it grounded at the shore at Inwood St. At 11.50 the float was removed to a point further out stream and it was observed thereafter to flow in a southerly direction until 12.40 P. M. when the float again grounded on the Manhattan shore. The float was removed a short distance outstream and thereafter observed——

Q. When?

A. At 12.40 and thereafter observed to take a generally southerly course until at 1.05 P. M. it turned to the shore just above Fort Washington Point. The float was then removed to a point
1056 further out shore and thereafter observed to follow the Manhattan shore until 2.05 P. M. when at a point just below 155th Street the float was observed to change its direction from a southerly course to a northerly course, and it was at this time taken from the water.

Q. Under your directions were the courses that you have just described relative to the float observations outlined on any map or chart?

A. They were shown on this chart at my direction.

Q. And what is the number of that chart?

A. It is Chart No. 8.

Q. Were they distinguished these three sets?

A. The observation of July 17th is distinguished in red lines and figures. The observation of July 19th is distinguished by green lines and figures. The observation of July 22nd. is distinguished by yellow lines and figures.

Q. How were the maps themselves prepared, or the charts upon which you have followed the courses of these various floats, the charts themselves, the maps?

A. The body of this chart, the back ground of the chart is a print from the tracing made of the United States Government Map for this vicinity, showing the essential——

Q. When were they made?

A. They were made in the office of the Commission.

Q. What commission?

A. The Metropolitan Sewerage Commission and from this tracing these duplicate maps were made by sun printing, and on these sun printed charts, the courses of the floats were plotted for the different periods of time at which they were observed. There are many more time intervals shown on the chart than I have testified to, intermediate locations which at a given hour indicates the posi-
tion of the float, and the position was determined in relation
1057 to the principal shore marks.

Q. What precautions did you use relative to safeguarding the accuracy of the tracing of the courses of these float experiments that you testified to?

A. The locations were made by a sextant, were made with an instrument that was corrected to take care of the instrumental errors.

Mr. O'Sullivan: I offer Chart No. 8 from which the witness has just indicated the location of the three experiments of July 7th, 1907 in evidence, and ask that it be marked Complainants' Exhibit No. 11.

Mr. Riker: One moment.

Recross-examination by Mr. Riker:

Q. Did you make the observations which are supposed to be recorded on this chart?

A. I did not make the observations personally.
Q. Were you present when the plottings were made on the chart?
A. I do not recall.
Q. How do you know they are correct?
A. I believe them to be correct?
Q. Have you any other foundation except your belief or your statement that they are correct?
A. Well, I have checked them as closely as was possible.
Q. With what?
A. With the notes and maps.
Q. Did you make the notes?
A. I did not. I checked them.

Mr. Riker: I object to the offer on the ground that it does not appear to contain any original observations of the witness.
The Commissioner: Note the objection.
Marked Complainants' Exhibit No. 11.

1058 Redirect examination by Mr. O'Sullivan:

Q. How many people would be engaged in the making of these observations, Mr. Provost?
A. Three or four or five as a rule.
Q. Performing different functions in regard to the same observations?
A. Yes.
Q. You mentioned in your previous testimony, Mr. Provost, something about sampling the waters by the committee of which you were an active member, on harbor work. What did you do with regard to the sampling of waters. Go ahead and describe what directions you gave; what was done and what was reported to you, and what you did with it?
A. Chapter 639 of the Laws of 1906 directed the Metropolitan Sewerage Commission to ascertain the presence and if possible the future sanitary conditions of the waters of New York Bay and adjacent waters. In order to determine this the Harbor Committee through its field force arranged for the taking of a great many samples of the harbor, bay and river waters in New York Slips and Canals in the vicinity of New York for the purpose of determining their present sanitary and physical character. This work of sampling was begun in January 1907 and during that year some 490 sampling stations were established throughout these waters. These stations have been accurately located and plotted on suitable charts.
Q. How?
A. By designating them under their respective numbers on a chart of this vicinity.
Q. How did you make the locations; how did you determine them?
A. The locations where they were adjacent to docks or slips, I made directly from notice of existing structures, such as docks or the street system of the city at that point. Where the stations were

removed from land marks, it was necessary to take a series of observations of the visible marks on shore by means of a
1059 sextant, and these were later reduced to their position and plotted on the chart in that form. Some of these stations were occupied once during the year, and some of them were occupied a great many times. At some stations a single sample of water was taken, and at other stations a great many samples of water were taken. At some stations the sample of water taken merely represented the surface of the stream at that point. At other stations were taken samples at various depths 5, 10, 15, 40, 50, 70 or 80 feet below the surface. Those samples were collected in jars and bottles and in containers suitable to the character of the work that was to be done. Some were immediately plated by bacteriological plates, culture plates and that sample then taken to the laboratory and subjected to various analyses to determine the constituent parts of the water or muds, and sanitary character. During the month of January 1907, there were forty-seven samples of New York Bay water collected chiefly in the vicinity of 49th Street Brooklyn.

Q. Before going into detail, for what were these various samples of water examined?

A. They were examined chemically, physically and bacteriologically.

Q. And the reports that were made to you what did they have to do with?

A. The reports made to me on this subject were compiled by me into the form as I now have them before me.

Q. They were tabulated?

A. They were tabulated and recorded each sample, with all of the data relating to that sample in a series of columns, which are headed by proper captions. Under the various samples there is recorded in the first column the date and hour at which the sample was taken. The next column records the number of samples taken at that point. The next column is the serial number of
1060 the sample, from 1 to 931. The next column records the depth from the surface of the water at which the sample was taken. The next column records where the examination was made, the number of bacteria per cubic centimeter in the sample taken. The next two columns record the tests for the percentages of intestinal bacteria which are called here B. Coli. Of these two columns, the first shows the presence or absence of B. Coli in the one cubic centimeter of the water. The second column shows its presence or absence in the one tenth cubic centimeter. The next column records the observed turbidity of the sample of water. The next records its color, its relative color, relative to a given standard. The next column records the chlorine in parts per million represented in the sample. The next column records the state or stage of the tide at the time the sample was taken. The next column records the characteristics of the wind, its direction and relative velocity or intensity. The next column records the temperature of the water at the time the sample was taken and at the location.

The final column is headed "Location and Remarks" and in this column is recorded in a general way the approximate locations where the samples were taken and any other data considered necessary to identify the sample for the purpose of this report.

Q. How many samples of water were taken from our harbor waters that you have tabulated in the way you have just described?

A. There were 931 samples taken and tabulated in this matter.

Q. Between what dates were the samples taken?

A. Between January 8th, 1907 and October 18th, 1907.

Q. Did you prepare the tabulations?

A. I did.

Q. And what is it you now have before you there?

A. I have a compilation of the field and laboratory records of these 931 samples of water taken from New York and adjacent waters.

1061 Q. And in what form are they?

A. In the form of blue prints.

Q. How was the original tabulation made?

A. The original tabulation was compiled by me personally from the daily reports of the field and laboratory engineers and scientists.

Q. Then what did you do with that original compilation, tabulation?

A. That original tabulation was turned over to the draugh-man who put it in the form that you see it now, on tracing cloth and that was compared with the original and thereafter sent to the printer and printed in this furm.

Q. And have you compared those blue prints with the original?

A. I have not compared every single item, but I compared a great many sufficient to satisfy me of their general accuracy.

Mr. O'Sullivan: I now offer set of blue prints 23 pages, entitled data relating to water samples Nos. 1 to 931 from New York Bay and vicinity, examined by the Metropolitan Sewerage Commission in 1907, being Sheets 1 to 23. I offer that in evidence.

Recross-examination by Mr. Riker:

Mr. Provost, did you make any of the original observations which are embodied in this series of tabulations?

A. I do not recall that I did.

Q. You do not know of your own knowledge whether they are correct or not?

A. I believe them to be correct.

Q. That is not an answer. Do you know of your own knowledge whether they are correct or not?

A. I have no knowledge that would permit me to state so.

Q. All you did was to simply take the material furnished you and put it in this tabular form, is that all?

A. That was my connection with the work.

1062 Mr. Riker: I object to the offer on the ground that the matter contained in it is not proved.

The Commissioner: Note the objection.
Marked Complainants' Exhibit No. 12.
At 4 P. M. adjourned to November 28th, 1911, 10:30 A. M.
Adjourned to November 28th, 1911, at 10.30 A. M.

1063 Supreme Court of the United States, Novembber Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Corporation Counsel's Office, Hall of Records.

NEW YORK CITY, November 28th, 1911—10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances: Dr. William J. O'Sullivan, Special Counsel for The People of the State of New York, Complainants. Joseph Coult, Esq., and Adrian Riker, Esq., of Counsel for the Passaic Valley Sewerage Commission, Defendants.

ANDREW J. PROVOST, a witness called on behalf of complainants, recalled for further examination, testified as follows:

Examination by Mr. O'Sullivan (resumed):

Q. Who were the assistants engaged in making the observations?
A. May I ask which observations you refer to?
Q. Those contained in Complainants' Exhibit No. 12, which I hand you?
A. The general conduct of this work was in charge of
1064 Mr. David A. Merritt. The bacteriological determinations were made by Doctor Payn B. Parsons. The chemical and physical determinations were made principally by Doctor Miller.
Q. P. Schuyler Miller?
A. P. Schuyler Miller. The samples were taken in the field in boats, in charge of any one of these three gentlemen.
Q. Who made the tidal observations as to high and low water?
A. There were no tidal observations for high and low water made by the commission during 1907.
Q. Where did you get your data relative to that?
A. That data was taken from the official records of the Department of Docks and Ferries.
Q. Who took that?
A. That department keeps a record of the tidal rise and fall in different parts of the harbor by means of automatic *guages*, float *guages*, which are connected with a clock working arrangement, which moves a pencil on the chart, so that the rise and fall of the

water is graphically shown on the chart. These records are preserved by the Department of Docks and Ferries and they give an indication of the tidal phenomena throughout the year. Those records were used by us, in checking up our work, and determining the times of high and low water.

Q. Did you yourself consult these records?

A. I did.

Q. Who made the meteorological determinations or data?

A. The meteorological observations?

Q. Yes?

A. They were taken from the published records of the meteorological observatory operated by the City of New York in Central Park under the direction of Dr. Draper.

Q. Have you a copy of his records with you?

A. I have a copy in my hand for the year 1907.

Q. Where did you obtain this?

A. I obtained them direct from the Secretary of the De-

1065 partment of Parks.

Q. I show you this copy and ask you what is it?

Mr. Riker: What is it that you are showing the witness?

Mr. O'Sullivan: I am showing him a copy of something I am asking him to describe.

A. This is the report of the New York Meteorological Observatory of the Department of Parks in Central Park, New York City for the year 1907, Daniel Draper Ph. D., Director.

Q. Did you receive that copy direct from the Meteorological station?

A. I did.

Mr. O'Sullivan: I offer that in evidence and ask that it be made Complainants' Exhibit No. 13.

Mr. Riker: I object to it on the ground that it appears to be a copy and is not a self serving document anyway.

The Commissioner: Note the objection.

Marked Complainants' Exhibit No. 13.

Q. Mr. Provost what was done either by the commission or under your direction relative to the collection of samples of mud?

A. During the year 1907, there were some 700 separate samples of mud collected and taken from the bottom of the harbor and from the deposits in various waters tributary to an- adjacent to New York Harbor. These samples, some of them were collected from the surface of the deposits. Other samples were taken at various depths, from the surface down. They were taken by various instruments where the surface sample only was desired, a spoon shaped dredge was used to collect the sample, the spoon being sterilized frequently during the course of the work. Where the samples were located at different depths, they were taken—a special ap-

paratus was used which was divided in sections separate

1066 from each other, each section having its appropriate door. The mud sampling device was pushed down into the mud

to a depth of 9, 10 or 12 feet, as the case might be, in a closed position, and after the desired depth had been reached, the shell of the apparatus was rotated to shut off each compartment being opened by this operation, and a portion of the mud adjacent to that compartment of the apparatus at that time was pushed in by means of a vane into the compartment which was then closed by rotating the apparatus. The instrument was then raised to the deck of the boat, the samples of mud were taken from each compartment and suitably labeled in proper containers. The apparatus was then sterilized by the use of live steam and an additional sample was taken. In these various manners some 700 samples of mud were collected and these were taken to the laboratory of the commission and were there examined as to their physical, chemical and bacteriological contents. Observations were also made on these samples for putrescibility, in some cases for the presence of oil and petroleum and other foreign matters.

Q. Who were engaged in securing these samples of mud?

A. The work was in charge of Dr. David 8. Merritt Engineer Analyst for the commission. The samples were taken either by him personally or by his assistants, Doctors Parsons and Miller, with the assistance of the crew on the vessel and the work in the laboratory was performed under the direction of Mr. Merritt by Dr. Parsons with regard to the bacteriological examinations. By Dr. Miller with respect to the physical examinations and the chemical examination including the oils.

Q. To whom did they report the results of their examinations and stations from which they obtained the samples of mud?

A. Those reports were all made to me as Chairman of the Harbor Committee of harbor work.

Q. And what did you do with the data that was sub-
1067 mitted?

A. The data was transcribed into appropriate tables, the information being in the form of loose leaf reports covering only the portion of the work for each sample. They were afterwards collected by me and compiled into tables under appropriate headings.

Q. Have you got the tabulations with you that you made of this work on mud samples?

A. I think you have them there.

(Counsel hands tables to witness.)

A. I have a tabulation here in my hand. It is entitled data relating to mud samples Nos. 1 to 705 from New York Bay and vicinity, examined by the Metropolitan Sewerage Commission in 1907, Sheets 1 to 17 inclusive.

Q. How did you make the tabulations; describe what the items or columns are that go to make that tabular report?

A. The first column of the table gives the date on which the sample was *elected*. The second column shows the serial number of the sample, from 1 to 705.

Q. What is the object of having a serial number?

A. So that the samples might be readily designated in a simple way for laboratory research without the necessity of describing the location of the sample to each man who worked on it.

Q. What was the next column?

A. The third column shows the approximate location of the station at which the sample was taken, referring to the bulkhead line, or to the shore marks or to the stations in the parts of the harbor removed from the shore marks. The next column shows the depth of the sample whether taken at the surface of the mud or at some depth below the surface of the mud. The next column shows the number, the total number of bacteria per gram of material. The next column shows where determined, the presence of B. Coli in one tenth cubic centimeters and also in one cubic centimeter. The next column, where determined, shows the putrescribility of the sample. The next column shows the loss on ignition of the sample in the parts per million by weight.

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Q. What does that mean, the loss by ignition?

A. That represents the organic matter contained in the material which can be driven off by evaporation or by ignition at a low slow even temperature.

Q. What is the next column?

A. The next column shows the color of the sample in relative terms. The next column shows the odor which was observed in these samples in relative terms. The next column relates to information observed as to the temperature and the depth of the water immediately over where the samples were collected. The final column is designated "remarks" and contains miscellaneous information which was considered important to designate the sample or to describe its general character.

Q. How many samples were there in all?

A. 705.

Q. Tabulated on how many sheets of blue prints?

A. Tabulated on seventeen sheets of blue prints.

Mr. O'Sullivan: I now offer in evidence data testified to by this witness, which he tabulated, described as data relating to mud samples, Nos. 1 to 705, from New York Bay and vicinity, examined by the Metropolitan Sewerage Commission in 1907, being Sheets 1 to 17 inclusive of blue prints tabulated in the manner testified to by this witness.

Mr. Riker: Before it is marked, I want to examine this witness.

Cross-examination by Mr. Riker:

Q. Mr. Provost, are these blue prints in fact copies of papers actually prepared by you?

A. They are.

Q. In the form in which it appears here?

A. I want to qualify that answer.

Q. I guess you had better.

A. The data shown on this blue print is data prepared
1069 by me as stated in answer to counsel a moment ago.

Q. I will have to re-ask that question? In the form in which these blue prints appear, were they copies of any papers prepared by you?

A. Copies prepared by me.

Q. In the form in which they appear here?

A. Will you explain what you mean by the word "copy". Do you mean transcribed or printed?

Printed from or transcribed from?

A. They are transcribed from records which I prepared personally.

Q. Did you arrange this data in this form?

A. In similar form.

Q. In that form. I ask you whether that is a copy of the form you prepared?

A. It is transcribed from a copy that I prepared personally.

Q. It is a copy of a transcript of a copy which you made?

Mr. O'Sullivan: I object to that. It is clearly contradictory to the testimony of this witness.

The Witness: It is a transcript of a copy which I made.

Q. Who did the transcribing?

A. It was done by a draughtsman in my office.

Q. So as a matter of fact this is not a copy of anything you did yourself?

A. Not of my actual figures, no.

Q. Now, Mr. Provost, did you make any one of the samples which purport to be shown on these blue prints?

A. Not personally, no.

Q. So that the first column containing dates, does not contain anything that is within your own knowledge?

A. Yes, I should say it did.

Q. How do you know the dates at which the samples were taken if you were not present?

A. Because I know what these men were doing all the
1070 time, most of the time; they reported to me daily.

Q. Did you see them?

A. I saw them go and I saw them come back.

Q. Did you see them take the samples?

A. No, not in every case.

Q. Did you see them take them in any case that you can testify on these sheets?

A. Not that I can identify now.

Q. Did you place the sample numbers on any of the samples?

A. I did not.

Q. How do you know they are, any of them, correct, as numbered on this blue print?

A. They are serial numbers and therefore their correctness is evident.

Q. They are evidently correct as applied to samples taken at certain dates, are they?
A. Yes, sir.
Q. In your opinion?
A. Yes.
Q. How do you know the locations at which these alleged samples were taken?
A. I have no knowledge beyond the reports made to me by my assistants.
Q. Have you anything within your own knowledge with reference to these alleged tabulations, of alleged information, except what you got from other people?
A. Substantially not.

Mr. Riker: I object to the offer on the ground that it appears by the witness' statement, that the supposed facts contained in the exhibit are not within his own knowledge and they have not been proved and that therefore the exhibit is at best at the present time hearsay.
The Commissioner: Note the objection.

Redirect examination by Mr. O'Sullivan:

Q. When were the facts which you have tabulated in this series of blue prints reported to you?
A. Promptly after each day's work.
1071 Q. Were they reported to you daily?
A. I received daily reports, yes.
Q. Of the work done as it was being done?
A. As it was being done.
Q. And these facts reported to you daily were the ones that appear in tabular form here made by you?
A. They are.

Mr. O'Sullivan: I offer that in evidence.
Mr. Riker: A few more questions.

Recross-examination by Mr. Riker:

Q. You say the reports were made of the work that was done; how do you know the work was done?
A. I saw very much of it done.
Q. You saw very much of it done; what part did you see?
A. The work in the laboratory.
Q. How much of it?
A. I could not say, saw it quite often.
Q. Can you pick out on these sheets any one instance of work that you saw done in the laboratory?
A. No, I would not attempt to.
Q. So that when you say the reports were daily given to you of the work done, do you mean anything more than that there were daily reports given to you?
A. That is what I mean.

Mr. Riker: That is all.

Mr. O'Sullivan: We will put the witnesses who made the reports and who did the actual work on. We cannot do it all at once. We have got to do this in sequence with some intelligence.

Marked Complainants' Exhibit No. 14.

1072 Redirect examination by Mr. O'Sullivan:

Q. What sort of an apparatus was used in making or collecting these samples of mud, Mr. Provost?

Mr. Riker: What is that, Doctor?

Mr. O'Sullivan: I have got a diagram here that I would like to put in evidence.

The Witness: I have in my hand a plan showing the apparatus which was used for deep mud samples. This apparatus was prepared, or the design of this apparatus was prepared by Professor Landreth, a member of the commission as a committee to investigate and report on the most feasible method of collecting such samples In the course of that investigation a research was made as to the existence of similar apparatus which has been used for such purpose, and it was found necessary to design this apparatus for our work. The plan is dated December 10, 1906, and is entitled Metropolitan Sewerage Commission, New York, N. Y. Boring Device for sampling Mud Deposits in New York Harbor, designed by Olin H. Landreth. The apparatus consists essentially of two pieces of concentric iron pipe, the inner pipe having appropriate apertures with the outer so that the samples of mud at different elevations could be pushed into the compartment into which the inner pipe was driven by partitions, and taken up as separate samples in each case.

Whole apparatus was shod by a tapered end in which there was inserted a plug at the end of an opening in which the extreme bottom sample could be taken. The diagram which I have here contains a memorandum of operating directions explaining how the apparatus is to be used. The first direction is to close the
1073 shutter by turning the top section of the pipe to the left against stop. The second direction is to screw cap on the top section of pipe and drive to necessary depth, always applying a slight rotary force to the left to keep the shutter closed. The third direction is to turn to the right somewhat more than one revolution. The fourth direction is to close the shutter by turning to the left against stop. The fifth direction is to pull upwards at the same time turn it to the left. The entire purpose of this apparatus was to secure samples of mud at different depths without mixing the samples during the operation of taking them.

Q. Did you see the original apparatus used?

A. Yes, I have.

Q. Was it constructed in conformity with the plans and specifications set forth?

A. It was substantially in accordance with this plan.

Mr. O'Sullivan: I offer this plan in evidence.

Recross-examination by Mr. Riker:

Q. Mr. Pr-vost, are you a mechanical engineer?
A. I have had some experience in mechanical engineering, yes.
Q. Are you a mechanical draughtsman?
A. I have had some experience in that.
Q. Did you make this plan of this machine?
A. I did not.
Q. Did you compare it in detail with the machine?
A. My impression is I did not.
Q. Did you have the plan with you when you saw the machine?
A. I do not recall that I did.
Q. When did you see the machine in actual operation?
A. My best recollection is in the summer of 1907.
Q. How many times did you see it operated?
A. I could not recall.
1074 Q. Where did you see it operated?
A. At the Anchorage in Gowanus Bay.
Q. During the rest of the time when it is assumed to have been in operation, taking samples of mud, how do you know whether the directions contained on it, and which you have read are complied with?
A. I have no knowledge except my directions were they should be complied with.

Mr. Riker: I object to the offer on the ground that it has not been proved, and that it is immaterial and irrelevant. It does not represent any fact concerned in the issue,—this cause.

OLIN H. LANDRETH, a witness called on behalf of complainants, being recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. I hand you plans and specifications that have just been objected to and ask you if you know what they are?
A. Yes.
Q. And who made them?
A. They were made in my office under my supervision and direction.
Q. Who designed the apparatus?
A. I did.
Q. For what purpose?
A. For the purpose of taking mud samples as part of the work of the Metropolitan Sewerage Commission of New York.
Q. What particular objective was there in having so elaborate an apparatus for taking mud samples?
A. So as to save time and so as to insure freedom of pollution of one sample by any other material. As a matter *or* economy of time we desired to secure at one operation, if possible, samples at various depths below the bottom of the harbor. There was no apparatus which were were able to learn of by which more than one sample

at a time could be obtained, and in our desire to secure economy of expenditure and rapidity of time, I designed this apparatus to take 5 samples at once

1075 As a matter of safety against pollution of one sample by another, we provided that the apparatus should be sterilized before being used in every case, and the apparatus was closed up and sent down into the mud and then filled with the sample and closed again and withdrawn without any sample of mud being disturbed by the mud above it or the water above it, and the drawing shows how these results are accomplished.

Q. Was there a machine or apparatus built in conformity with the plans and specifications which you set forth?

A. Certainly.

Q. Did you ever see it in operation?

A. I did.

Q. Were you present when any of these mud samples were taken?

A. Yes.

Mr. O'Sullivan: I now offer the plans and specifications which have been testified to by the designer and the one who has actually operated them in evidence.

Cross-examination by Mr. Riker:

Q. Are you a mechanical engineer?

A. No, sir.

Q. Are you a draughtsman?

A. Yes, sir.

Q. Did you draft this plan?

A. I did not.

Q. Did you actually compare this draft with the apparatus as it was used in your presence?

A. I did.

Q. In detail?

A. In detail.

Q. How often did you see the apparatus in operation?

A. About two or three times.

Q. That is all the knowledge you have in regard to the use of it?

A. That is all of the absolute knowledge I have. I have absolute confidence in our assistants, and in the fact that they carried out the instructions as they were made.

Q. Has this apparatus been used for any other experiments than these cases to your knowledge?

A. I think not.

1076 Mr. Riker: The offer is objected to on the ground that it is immaterial and irrelevant.

Mr. O'Sullivan: The offer is renewed on the ground that it is most material in showing that every possible safeguard was devised to surround these experiments and determinations as to their accuracy as much as it is possible by human effort to obtain.

Mr. Riker: The objection is renewed on the ground that this appears to be an experimental machine by a man who is not a mechanical engineer, and whose use has never been sanctioned by experience in any other connection.

The Commissioner: Note the objection.

Marked Complainants' Exhibit No. 15.

ANDREW J. PROVOST, JR., a witness called on behalf of complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. How were the stations from which these samples were taken located?

Mr. Riker: I object on the ground that this witness has testified that he does not know of his own knowledge where the samples were taken.

The Commissioner: Note the objection.

A. They were located in serial numbers on a chart, this chart being that which was constructed by the United States Government of Surveys made in the vicinity of this harbor. The sampling stations were designated,—were located on this chart from shore
1077 marks which were observed tied in from these points at which the samples were taken.

Q. How were the locations made or determined?

A. Where the points of sampling were remote from the shore, from immediate shore marks, they were observed by sextant observations. When the sample was in the vicinity of docks, piers and established street lines, the sample stations were located on the chart with reference to their distance from these marks.

Q. Did you use any instruments in making the locations where the distance was remote from the shore?

Mr. Riker: The question is objected to on the ground that this witness has already said that he wasn't present even when the samples were taken.

The Commissioner: Note the objection.

A. The distance from a given point at a remote station would be determined by the sextant observations, there being in each case at least three angles taken, which, by calculation and plotting on the chart would show the relation of that station to the shore marks which were observed.

Q. When were the locations from which the samples were obtained reported to you?

A. They were reported to me officially when the chart showing them was completed. In previous reports they were designated were described, the approximate locations were described.

Q. Did you cause these locations to be plotted?

A. I did.

Q. On any map?

A. I did. I directed that they be so plotted.

Q. I show you a map and ask you if you know what that map pertains to show, and if it was prepared under your direction?

A. This map was prepared under my direction. It shows the locations of sampling stations 1, to 490, occupied during the year 1907 by the Metropolitan Sewerage Com-ission in taking samples of water and mud for examination and study. The stations 1078 occupying the Hudson River from the Battery to a point in the vicinity of Ludlow.

Mr. Riker: Now, until the document is at least offered, I object to his testifying to any of the contents of it.

The Commissioner: Note the objection.

Mr. O'Sullivan: I will ask him what it shows first, what it is, before I offer it. Let him describe it so it will appear on the record.

Mr. Riker: He is not going into details to testify without objection, is not going to testify as to what the document contains or shows. There is no objection to a description for identification.

The Witness: The stations shown on this chart formerly occupied the East River from the Battery to the mouth of the Harlem River. They were also located in the Harlem River from its mouth to the Ship Canal and through the Ship Canal to the Hudson River. These stations were located in Newtown Creek from its mouth to the head of the Newtown Creek Canal. These stations were located in the Wallabout Bay. They were located in the Gowanus Basin and Canal. They were located throughout the Upper Bay, the Narrows, Gravesend Bay and Lower Bay, to near the outer mouth of the Ambrose Channel. They were located in the Kill von Kull from its mouth to the Newark Bay, and in Newark Bay from the Kill von Kull to the mouth of the Passaic River. They were located also in the mouth of the Coney Island Creek.

Q. Who prepared that map?

Mr. Riker: One moment, I want to put in an objection there. I object to this answer first as not being responsive, and second as giving the contents of an instrument which has not yet been 1079 offered in evidence, and is not in evidence.

The Commissioner: Note the objection.

Q. Who prepared the map on which you did these plottings?

A. The map showing the location of these stations was prepared under the direction of myself as the Chairman of the Committee on Harbor work, by Mr. David S. Merritt and his staff.

Q. My question relates, Mr. Provost, to the map itself, not to the plottings?

A. You mean the chart?

Q. The chart or map?

A. The chart is a chart prepared by and issued by the United States Coast and Geodetic Survey Department, connected with the Department of the Interior, Washington.

Q. For the National Government?

A. For the National Government.

The Court: When, what year?

The Witness: The map is endorsed, Beacons and Bouys, collected from information received to August 15th, 1911. It was published at Washington in August 1910 by the United States Coast and Gerdetic Survey. It is designated as Chart No. 120 New York Bay and Harbor.

Q. And did you secure that map yourself?

A. I did.

Q. From where?

A. From one of two agencies in the City of New York where such maps are kept for public sale.

Q. Under your directions were the plottings of the locations of these mud samples and water samples made upon that map?

A. They were made upon this map at my direction.

Q. And are how indicated on the map?

A. Indicated on the map in red circles and figures.

Mr. O'Sullivan: I now offer that chart or map in evidence.

Cross-examination by Mr. Riker:

Q. Mr. Provost, when was this chart placed in your
1080 hands in its present form?

A. You mean with everything on it?

Q. That is what I mean, that is what I said?

A. I should say about a month ago.

Q. Did you ever see it before in its present form?

A. Before it was placed in my hands, no, excepting during its construction.

Q. When did you purchase the map, the foundation, the publication of the Government?

A. I should say in September of this year, probably.

Q. You had it prepared for this suit, did you not?

A. I presume it was prepared at the request of counsel.

Mr. O'Sullivan: It was prepared under my directions.

Q. What else did you have to do with this except buying the foundation map from the agent and receiving it in its present form?

A. I directed and supervised the drafting work on it.

Q. Were you present when it was being done?

A. Considerable of the time.

Q. How much of the time?

A. I could not say, quite frequently, several times a day.

Q. What marks, notations or stations can you identify as having been made in your presence?

A. I do not know as I can identify any at the present time.

Mr. Riker: I object to the offer first on the ground that it is irrelevant and immaterial. Second on the ground that it does not contain any facts which have been proved in this cause, and third because the making of the sample has not been testified to by

the person who made it or under who- immediate supervision and direction it was made.

The Commissioner: Note the objection.

Marked Complainants' Exhibit No. 16.

1081 Redirect examination by Mr. O'Sullivan:

Q. Mr. Provost, were any plottings done on other maps at the time or shortly after the time that the reports were made to you by Mr. Merritt and Mr. Miller and Dr. Parsons?

A. A progress map was made of the locations of these stations, during the time the work was in progress and after its completion, charts were placed in my hands by Mr. Merritt, the Engineer Analyst, showing the locations of all these stations, on the larger scale maps prepared by the United States Government.

Q. And when were those plottings made?

A. These plottings were made during the year 1907.

Q. And have you got the maps with the plottings as they were made in the year 1907?

A. I have a series of charts here from A to G inclusive, which are copies of the original maps prepared by Mr. Merritt.

Q. And was it from these charts or maps that the plottings were done on Complainants' Exhibit No. 16, to which you have just testified?

A. The plottings on that exhibit are compilations of these several charts.

Q. Which was the first of the charts on which plottings were done?

A. Chart A, New York Bay and Harbor Polyconic projections, published at Washington, D. C. in February 1907 by the Coast and Geodetic Survey.

Mr. Riker: What date was that.

The Witness: 1910.

Q. I thought you said you had maps where the plottings were in 1907?

A. These are copies of this map made in 1907. I have not the original maps with me. They may be here.

Mr. O'Sullivan: I am not allowed to offer these in evidence, but I would ask you to compare those maps with the originals.

(The witness examines tracings and copies.)

This set of tracings shows from 1 to 16 inclusive, and is entitled Metropolitan Sewerage Commission, New York.

1082 Mr. Riker: Do I understand that you offer these?

Mr. O'Sullivan: I am not allowed to offer these.

Mr. Riker: I object to the witness using them.

Mr. O'Sullivan: I will insist on his making a comparison with the ones I am going to offer.

Mr. Riker: Very well, I object to his using them at all, unless they are offered in evidence.

The Commissioner: Note the objection.

Q. How long would it take to make blue prints of these?

A. Tomorrow.

Q. Did you have an index prepared as a guide to the plotting which you have just described in Complainants' Exhibit No. 16, which represents the aggregate as you testified to the plottings that had been done on the several tracings?

A. I prepared that index myself.

Q. And what does that index show?

A. The index shows the serial numbers of water samples and of mud samples taken at the several stations, which were shown on a chart, and they refer to the various charts lettered from A to G, and they show the locations on that chart with respects to sections of the chart. Knowing the station numbers it is possible to readily ascertain what samples of mud and water were taken at that station for examination, and to locate them accurately on the charts which were prepared showing those stations. Knowing the serial numbers of the water samples, and of the mud samples, it is possible to determine at what station they were taken and where that station is shown on the particular chart.

Q. Who prepared that index?

A. That index was prepared by me personally.

Mr. O'Sullivan: I offer that index of the various plottings in evidence.

Recross-examination by Mr. Riker:

1083 Q. Mr. Provost, does that index refer to anything except the tabulations and maps included as exhibits under objection in this cause?

A. I do not recall the objections. I think you object to everything.

Q. I am not speaking of that. I say does it refer to anything except the exhibits which have been offered in this cause under objection?

A. It refers to the tabular sheet relating to the collection and examination of 900 odd samples of water and 705 samples of mud, and to the locations where those samples were taken as shown by the sampling stations on various charts.

Q. Any charts that have not been produced here and offered?

A. It relates to no charts that have not been produced here.

Q. And offered in evidence?

A. My recollection is they were offered in evidence.

Q. That is your recollection?

Mr. Riker: I object on the ground that it appears that it is merely an index of exhibits that have been offered and objected to, and objected to on the ground they are *are* immaterial, irrelevant, and have to do with matters that have not been proved in the cause.

The Commissioner: Note the objection.

Marked Complainants' Exhibit No. 17.

Mr. O'Sullivan: I will withdraw this witness for the moment, until I identify the original tracings. Will you take the stand, Mr. Merritt.

DAVID S. MERRITT, a witness called on behalf of complainants, being first duly sworn, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Where do you reside, Mr. Merritt?
A. Tarrytown.
Q. Do you hold any official position in Tarrytown?
A. I am the Engineer and Superintendent of the Water Department.
1084 Q. Where did you pursue your studies, Mr. Merritt?
A. Union College.
Q. What course did you take in Union College?
A. The Engineering Course and the Scientific Course.
Q. Did you have any experience in laboratory work during your college course?
A. I did, yes, sir.
Q. Under what particular professor at Union College did you study?
A. In the laboratory work?
Q. Yes.
A. Professor Perkins.
Q. What was the line of study that you pursued under Professor Perkins in the laboratory?
A. It was chemical work.
Q. Did it have particular relation to any special line of study?
A. It was general chemical work and especially in regard to water analysis.
Q. In what year was that?
A. That was from 1880 to 1884.
Q. Did you later take any special line of work for biological study?
A. I did, under Professor Perkins. I took up chemical work in about 1900. The chemical work for about a year.
Q. Did that embrace work in infusoria and rhizopoda, anything in that line?
A. I did take work, biological work, and Professor Perkins assisted in that work, which embraced Kent's Infusoria, Liddy's Rhizopoda and Hudson & Gosse's Rotifera and Wall's Diatomaceæ and his Algæ and Desmidiaceæ. At his suggestion also I took a course in bacteriology, or three courses really. That was at Chicago University, on bacteriological technique, and advanced bacteriology and they fixed up a special course for us. This study was under Dr. Cole recently from Berlin in Bacteriology. I think that was from 1900 to 1902 about.
Q. Do your duties as Superintendent of the Water Works at Tarrytown still necessitate your subjecting water to a series of analyses?
A. Yes, all the time.
Q. Were you at any time connected with the Metropolitan
1085 Sewerage Commission of New York?
A. Yes, late in the Fall of 1906 and in 1907 up nearly to the end of 1907.

Q. In what capacity were you serving the Metropolitan Sewerage Commission?

A. As Engineer and Analyst.

Q. Were you present today when Mr. Provost was testifying as to the mud samples?

A. Yes.

Q. Did you in the line of your duties for the Metropolitan Sewerage Commission, do any plottings or tracings indicating the locations of mud and water samples?

A. I did.

Q. Was that part of your duties?

A. Part of my work, yes sir.

Q. I show you a set of tracings and ask if you recognize them, Mr. Merritt?

A. I do, yes, sir.

Q. What are those tracings?

A. They are tracings of the harbor on which are located points where the samples were taken.

Q. By whom were the locations made?

A. The locations almost all of them were made by myself. A few of them were made by Doctor Parsons and Dr. Miller.

Q. Under your directions?

A. Under my directions, yes, sir.

Q. Will you look at these various sheets, Mr. Merritt and see if you identify them; look at those figures.

Mr. Riker: Counsel calls for counsel for the complainant to state the purpose for which he introduces these papers in evidence.

Mr. O'Sullivan: I propose later to introduce blue print copies of these original documents which I am forbidden to introduce directly in evidence by the body that has custody of them, as they are being used continuously.

Mr. Riker: I object to the use of the papers by the witness in any way unless they are to be introduced in evidence.

1086 The Commissioner: Note the objection.

(Witness examines tracings).

Q. Having looked through these sixteen tracings do you recognize them as work done by you while in the service of the Metropolitan Sewerage Commission?

A. I do.

Mr. O'Sullivan: I ask that these be marked for identification, Mr. Commissioner, and I propose later to have copies of these made and introduced in evidence.

Marked by the Commissioner for identification with the signature of the Commissioner.

Q. Mr. Merritt, what were your duties as engineer and chemist to the Metropolitan Sewerage Commission?

A. Why I had general charge of the laboratory work and the taking of the samples. These samples were taken and reported to the

office. Of course I had also charge of getting the things for the laboratory, the material necessary.

Q. Did you have charge of the laboratory?

A. Yes, I had also charge of the boat.

Q. And charge of the boat?

A. Yes.

Q. Who were your assistants?

A. For the most part of the time Dr. Parsons and Dr. Miller. In the early part of the time a gentleman by the name of King was there for a short time. There was a man by the name of Britsky, for a short time.

Q. I mean your regular steady assistants?

A. Dr. Parsons and Dr. Miller.

Q. What topics were you given to investigate for the Metropolitan Sewerage Commission?

A. To get the water samples and take the mud samples and follow out routes by the tide. That was special work that was given to us.

Q. Do you recall what directions and instructions you received from the commission as to the line of work?

1087 Mr. Riker: One moment. I object to it as immaterial, what instructions he received.

Mr. O'Sullivan: I did not ask him what instructions he received. I asked him what he recalled.

Mr. Riker: It is immaterial whether he recalled it or not.

The Commissioner: Note the objection.

(Question repeated by the stenographer.)

Mr. Riker: Same objection.

The Commissioner: Note the objection.

A. I recall in a general way—of course I do not recall all the details, there was so much instruction, I do not recall all of the details, but in a general way the commission would give their orders to what sections—where to have the work done and where to take the samples. They located the work where it was to be done, whether it was mud work or whether it was water work, and usually also the localities where the samples were to be taken.

A. And how many men did you have working with you when you were getting these samples?

A. Why I usually beside myself, there were three, if I remember rightly, about three.

Q. Who would they be?

A. That would be the boat hand who would help me in hauling up the sampling apparatus, hauling up the samples for me.

Q. I show you Complainants' Exhibit No. 15, and ask if you secured any of these mud samples with that apparatus designed by Professor Landreth?

A. Yes, there were quite a lot of them. I do not remember just the number that was taken with that, but a large number of the mud samples were taken with that machine.

Q. After you would secure the samples of mud or of water or of both, to whom did you report?

A. Well, I brought in the samples into the Laboratory and usually Mr. Parsons and Mr. Miller would take them and analyze
1088 them, and then I would report usually to Mr. Provost, and also have Mr. Miller and Mr. Parsons report to Mr. Provost also.

Q. And Mr. Miller and Dr. Parsons were working under your directions?

A. Yes, sir.

Q. What kind of a boat did you use in securing these samples?

A. There were two boats, the first was what was called a clam digger. I should judge it was about 50 feet long, might be 60 feet—probably 50 feet long and I should think 10 feet beam probably. On that boat we had a little room—built a little room onto it where we had a desk located, also a boiler from which we were enabled to have steam for sterilizing purposes. We kept that until—I do not remember the exact date—I would not say. Then we had another boat, that was in the summer I think. The boat I think was about 50 or 60 feet long, but it was not as strong as the other one. It was impossible to draw up the mud digger on that boat. There was no mast on it. The first boat had a mast on it and we had an arrangement fixed so that we could pull up the mud digger. On the second boat we were not able to do that. We had to take the samples in a different way. The second boat we kept until I think it was November.

Q. Did you engage in the float observations?

A. Yes, I engaged in the float observations, also I had Mr. Merritt engaged in the float observations, also Mr. Miller engaged in those. The whole three of us used to go out at times.

Q. How did you take the samples of the harbor waters?

A. The samples usually were taken at the surface and at different depths. The first samples that were taken we lowered a cage in which was a glass bottle, a glass stoppered bottle. And after it got to a certain depth we would pull out the stopper with a spring in the cage and the bottle would fill with water. I think in that apparatus the stopper was replaced again. I think it would re-
1089 place the stopper. In the later work we did not bother with the cage in that form. We built another cage that suited our purposes better, merely consisting of a large container, in which was probably—in the bottom was about 12 or 15 pounds of lead at the bottom. The object was to sink the cage rapidly, so that it would not float with the tide. We had had some trouble with the tide. For the large samples we had 25 or 30 pounds of lead in the bottom so that it would sink rapidly. Those bottles were sunk down. A rubber stopper was put in first and the rubber stopper was pulled out and then they were all pulled up.

Q. What did you do when you brought the sample of water to the surface?

A. Those water samples were brought into the laboratory and analyzed, or partially analyzed.

Q. How did you secure the samples of mud?

A. We secured them at first with the machine which has been described here and which I saw built largely. I was present four or

five times at the building of the machine in Newark. I forget the gentleman's name who built it, but I remember that the plans were thoroughly carried out in building that machine. A large number of the samples, the larger part of the samples during the early part of the work, while we had the first boat were taken with that mud digger, as we called it. The mud digger would be lowered to the requisite depth, or the sample could be taken one at the surface, and then go down 4 or 5 feet deep. Sometimes we could push it down to 8, 10 or 12 feet. We have gone as low as 12 feet. The mud was so soft we could get down to 12 feet. It was rotated so the ports would open, and then it was rotated back so that the ports would close. The *the* mud sample was brought up in the different ports. They were opened—using as a safeguard against any possible contamination, a sterilized knife like a case knife. The round part was clipped off so it gave a clean surface without any possibility of contamination. If there was any contamination we wanted
1090 to obviate that. In the sample, a small tube, I should judge about three eight-s of an inch in diameter,—with a plunger was pushed into the sample and drawn out, and with it was a sterilized brass tube, and this was transferred to a test tube, sterilized test tube, and the test tube was again plugged with a cotton plug, brought into the laboratory and analyzed.

Q. The- what did you do?

A. Dr. Parsons usually took charge of them. I think that practically all of the mud samples were analyzed by Dr. Parsons. The first direction was to take the mud sample in the test tube in its moist state and weigh it on the analytical balance, and then take a piece of the mud out, the moist mud, and put back the plug and weigh it over again. That would give the weight of the mud sample. At first we took the weight without the plug. That gave us the weight of the plug. Then the plug was put back and the mud sample was dried. Then the weight was taken again. I think in the latter part of the work we omitted one of the weighings. That is the mud sample was taken out of the sample, and instead of putting back the plug we put it on without the plug. Then after that it was heated and dried again and weighed without the plug, if I remember rightly. That was the way it was done. These samples were in their moist state—were put in a certain amount of water—I forget just the amount of water used, but they were shaken up and the count taken. I think, in 48 hours, if I remember rightly. The count taken from that mud sample.

Q. What count was taken?

A. The bacterial count. The count of the cultures.

Q. What methods were used in locating the area from which the samples of mud or water were taken?

A. This work was almost entirely done by use of a sextant when we were out in the Bay anywhere. When we were in the River close to shore, we would approximate the distance 100 feet or 200 feet as the case might be, when we were close to shore. When it
1091 was far enough -way to use a sextant, we usually used a sextant.

Q. Part of your duties are to be able to measure distances?
A. Yes.
Q. That is part of your daily work?
A. Yes.
Q. How did you conduct the float observations?
—. By following a float. We had a float with sheet iron vanes and these little vanes were nailed first to a piece of wood, I think, about 2 inches square. I know it was two inches square, the size of the stick. At the top of the stick, there was a piece of wood bound fast to it, so that the entire float and the stick would be submerged and we would merely see the top of it. On the top of this stick there was a little stick about one half inch square sticking up about 2 feet. On that there was a little red flag nailed. Then we followed these floats and located their position at different tides.
Q. And to whom did you report?
A. We reported all these things to Mr. Provost.
Q. How many men would accompany a boat in making float observations?
A. Usually two or three. In the early part of the work three; in the latter part of the work two.
Q. And the observations were made each day and reported?
A. Yes.
Q. And reported to Mr. Provost?
A. Yes.
Q. By you?
A. Yes, by me and Mr. Miller and Dr. Parsons.
Q. What kind of a laboratory did you have under your supervision?
A. A little laboratory down in the Aquarium Building. I should judge the room was possibly 25 feet square, in that neighborhood. In that we had distilling retorts and condensers and balancers and the necessary paraphernalia of a laboratory.
Q. Who did the chemical analyses under your direction?
A. Mr. Miller.
1092 Q. Mr. P. Schuyler Miller?
A. Yes.
Q. And who did the bacteriological work under your direction?
A. Dr. Parsons.
Q. Dr. Payn B. Parsons?
A. Yes.
Q. What do you say as to the methods and standards employed in the work of the laboratory under your direction?
A. They were largely—I might say wholly the methods of the Public Health Association, their standards.
Q. And methods?
A. And methods.
Q. What kind of determinations were made in that laboratory under your direction?
A. Why for the bacteriological work of course the counts were taken.
Q. Of the bacteria?

A. Of the bacteria, yes, and the putrescibility of the sample was usually taken, of the water sample. I think Dr. Miller took the color and the turbidity also in the mud samples he took, by the ignition method, the loss by ignition.

Q. Who made the Coli determinations?

A. Dr. Parsons made those.

Q. Were salinity tests made under your direction?

A. Yes, quite a large number of salinity tests.

Q. Who observed the matters of turbidity and color?

A. Dr. Miller did all that. Of course I did it once in a while, not very often. Most of the work was done by Dr. Miller.

Q. You were in charge of the laboratory?

A. Yes.

Q. And everything was done under your direction?

A. Yes.

Q. Did you take the temperature of the water when you took the samples?

A. We always took the temperature, nearly always, if not always. Our records show that. I cannot tell now about every time, I think nearly every time we took the temperature and the direction of the wind, most always. That was all in the note book.

Q. Did you report the work of Mr. P. Schuyler Miller and Dr. Parsons as well as the work that you did?

A. No, they reported their own work.

1093 Q. Separately?

A. Separately. They were distinct. The general reports that I made to Mr. Provost largely were verbal reports, explaining to him as they went along day by day just what was done. Of course the written reports that I made they speak for themselves. I kept them in touch constantly with the work which was going ahead.

Q. You made oral and written reports?

A. Yes, both.

Q. And as to the details of the work done both chemical and bacteriological, how were those reports made?

A. The details of these observations were reported in writing by Mr. Miller and Dr. Parsons to Mr. Provost.

Q. Now, in making these observations did you take and inscribe the date and the hour and the number of samples taken?

A. Yes, I think all of those were set down in the books that way.

Q. You kept field note books, did you?

A. Yes.

Q. Have you ever seen these field note books before today?

A. Yes.

Q. Since you used them?

A. No, I have not seen them since then.

Q. Since 1907?

A. That is the last I have seen of them, 1907 or the beginning of 1908. I forget just exactly the date. They were all turned in to the Sewerage Commission.

Q. You have not had a chance to compare your field note books with the tabulations?
A. No, I have not compared them.
Q. When did you come from Tarrytown?
A. This morning.
Q. When did you see me for the first time in your life?
A. This morning.
Q. Did you ever talk with me before?
A. Never did in the world.
Q. You have been ill for some time past, have you not?
A. Yes, since July 10th.

1094 Mr. O'Sullivan: Before I continue your testimony I will have to tell you to compare these field notes with the exhibits, and I will take up your examination after that.

P. SCHUYLER MILLER a witness called on behalf of the complainants, recalled for further examination testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Mr. Miller, were you a member of the staff of the Metropolitan Sewerage Commission?
A. I was.
Q. In what capacity?
A. As chemist.
Q. What line of work did you do?
A. I made such chemical and physical examinations of samples of water as I was directed to by the commission or by Mr. Merritt the Engineer in charge of the laboratory.
Q. The gentleman who just left the stand, Mr. David S. Merritt?
A. Yes, Mr. David S. Merritt. I was directly under his orders.
Q. Who secured the samples that you worked on of the water?
A. All water samples, part of them were taken by me personally and part of them by Dr. Payn Parsons and Mr. D. S. Merritt.
Q. In your presence?
A. No, not always.
Q. I show you Complainants' Exhibit No. 12 and ask what samples of the waters therein set forth were examined and taken by you?

Mr. Riker: That is a double question, Doctor?
Mr. O'Sullivan: I think he can answer it.

Q. Before you answer that question, I ask you if you have had an opportunity since yesterday to examine the data set forth in Complainants' Exhibit No. 12 and compare it with the orig-
1095 inal note books, that you made at the time of the determinations set forth in tabular form in that exhibit?
A. I have examined this exhibit which I hold now since yesterday and compared it with the original data taken.
Q. Made by?
A. Made by myself.

Mr. Riker: Before you go on, I would like to ask a few questions.

Cross-examination by Mr. Riker:

Q. Have you the original memorandum with you?
A. I have.
Q. Did you have any part in making the tabulation?
A. I did not.

Mr. Riker: If he is going to use the exhibit for the purpose of refreshing his recollection I call upon counsel to use the original memoranda which he made himself, which appears now to be in his possession.

Mr. O'Sullivan: The tabulation offered in evidence as complainants' Exhibit No. 12 represents the work done by both bacteriologists and chemists. Their reports were submitted to the man in charge of the work, Mr. Provost, and he tabulated them for purposes of convenience and intelligent study of the commissions, which they undertook. To describe them in isolated form, the particular observations of Mr. Miller, would deprive the exhibit of coherence, and his testimony is now offered to verify the figures in that exhibit, which have been contributed by the witness on the stand, Mr. Miller.

Mr. Riker: I object to this witness using the charts, for the reason that it appears that he had no part in making them and therefore they cannot serve to refresh his memory, and for the further reason that it appears that the original memorandum made
1096 by himself *are* now in his possession and can be used for the purpose of refreshing his memory. That the testimony as to the materiality of the exhibit and the tabulations can only be of the fact that the exhibit contains certain figures and therefore it is not material or relevant to the issue in this cause.

The Commissioner: Note the objection.

Q. Mr. Miller, have you the original notes made at the time of the various determinations that are recorded in the tabulaf form and as they were made by you?
A. I have.

Mr. O'Sullivan: This exhibit is not used to refresh this witness' memory. This witness' testimony is about to be elicited to verify the figures therein recorded, and make any corrections that are not in accord with the original notes.

Q. Now, state the samples that were collected by you and when, and what determinations you made?

A. I made determinations of turbidity, color and chlorine in all samples from 291 to 931 inclusive. Of these samples I personally collected samples 291, to 367 inclusive, 368 to 444 inclusive, sample No. 454, sample No. 745, sample No. 775, and sample- 875 to 906 inclusive. Those are the samples collected by me. The remainder of the samples from 291 to 931 were collected by Dr. Payn Parsons and Mr. Merritt and brought to the laboratorv for my examination.

Q. Take each sample and describe, beginning with the first that you selected to analyze, stating where you took the sample, what you did with it, and what your chemical examination revealed?

A. Sample No. 291 taken April 23rd, 1907, at 10 A. M. from the Hudson River 500 feet off the Battery, depth of sample, surface, tubidity 2, color 11, chlorine 8,550.

Sample No. 292, taken on the same day at the same time
1097 at a depth of 10 feet at the same place, gave a turbidity of 2, color of 5, and chlorine 9,450.

Sample No. 293 taken from the same place on the same date at approximately the same hour, at a depth of 20 feet, gave turbidity of 2, color 4, chlorine 11,800.

Sample No. 294 taken from the same point on the same day, at approximately the same hour, at a depth of 30 feet gave turbidity of 1, color of 3, chlorine 11,600.

Sample No. 295, taken at the same point, on the same day, at approximately the same hour, from a depth of 40 feet shows a turbidity of 1, color of 2, chlorine 14,400.

Sample No. 296, taken from the same point on the same day, and at approximately the same hour from the bottom shows turbidity 2, color 4, chlorine 14,050.

Sample No. 297,——

At 1 P. M. adjourned for Noon recess until 2 P. M.

1098 Corporation Counsel's Office, Hall of Records.

NEW YORK CITY, November 28th, 1911—2 p. m.

Mr. O'Sullivan: I will withdraw the witness who is on the stand and put on another witness, Mr. Commissioner.

The Commissioner: All right.

PAYN B. PARSONS a witness called on behalf of complainants, being first duly sworn, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. What is your full name?

A. Payn B. Parsons.

Q. What is your vocation?

A. Bacteriologist; I am a physician and bacteriologist.

Q. Where did you study medicine?

A. I am a graduate of Williams College, Albany Medical College, a post graduate of Cornell University, that is the medicine school.

Q. Have you taken up any specialty in medicine?

—. Well, my specialty has been bacteriology of course.

Q. How long have you been working as a bacteriologist?

A. Since 1904.

Q. You have been steadily working as bacteriologist since?

A. Yes.

Q. Were you connected at any time with the Metropolitan Sewerage Commission?
A. Yes.
Q. When did you first become engaged by the Metropolitan Sewerage Commission?
A. In 1907.
Q. What duties did you perform for the Metropolitan Sewerage Commission in 1907?
A. I held the position of bacteriologist.
Q. Where was the laboratory?
A. In the Aquarium Building, the second floor of the Aquarium Building, in the front.
1099 Q. And who was your chief of staff?
A. Well, we were under—our immediate chief was Mr. David S. Merritt.
Q. And to whom did you report the result of your work?
A. I reported the result of my work to the commission, the Metropolitan Sewerage Commission direct.
Q. Who did the chemical work during your line of service?
A. Mr. P. Schuyler Miller.
Q. Did you furnish reports to the commission?
A. Yes.
Q. Have you got these original reports now here with you?
A. Yes.
Q. You produced them at my request?
A. I do not care to put them in evidence, but I could produce them for the sake of scrutiny if anybody wants to see them. They are reports of course to the commission, original office reports.
Q. What bacteriological work did you do during 1907 for the Metropolitan Sewerage Commission?
A. I made bacteriological studies of the waters of New York Harbor and bacteriological studies of the harbor bottom the so-called mud.
Q. I hand you Complainants' Exhibit No. 12, and ask if there are recorded in the tabulations in that exhibit any of your work?
A. Yes, my work includes the bacteriological results of samples 12 to 931 inclusive. The bacteriological work.
Q. In what did the bacteriological examination consist?
A. Consisted in determinations of the total number of bacteria in the water. You are speaking of waters now?
Q. Yes.
A. Of the waters of New York Harbor, and as a rule it was a case of the numbers of bacteria. Now, in some cases as they are given in this view, the B. Coli determinations were also made.
Q. Who made the bacterial counts of these samples?
A. I made them myself.
Q. Who made the tests for the B. Coli.
A. I made them.
1100 Q. You yourself personally?
A. Yes.

Q. Have you compared complainants' Exhibit No. 12 with the original reports made by you during the year 1907?

A. Yes, sir, I have.

Q. How did them compare?

A. They agree.

Q. Were you present when any of these samples of water were taken?

A. They were collected in so-called vacuum tubes. It is about the size and shape of a test tube with the point drawn out and bent, and the sealing is done when the tube is what might be called red hot, in heated condition, so there is a partial vacuum form in the tube, and this tube was lowered to the required depth in a sampling apparatus, weighted with lead, and when the required depth was reached the point of the vacuum tube was broken off by a sudden jerk on the sampling apparatus. That is to say a connection was made by a silk string with a little brass—a small piece of brass like a ring, put over the end and was lowered carefully. Then between the rope and the sampling apparatus was a spiral spring, so that when a little jerk was given, the silk cord which was uniform strength, no elasticity to it, it would break off the top of the vacuum tube and the tube would fill with water from that depth. Then, being full, of course it would not gain any more by being drawn up to the surface.

Q. Did you collect any of these samples?

A. Yes.

Q. What did you do after collecting these samples?

A. I plated the samples out in petridishes, first diluting the samples so that the counts of petridishes would be collected. That is, so that the plates could be easily counted. The plating was done on standard gelatin as a medium. The plates were then incubated at room temperature and counted.

Q. Were the methods you have just described prescribed
1101 by any special body for the observance of bacteriologists making examinations such as this you are testifying to?

A. The bacteriological work that is the plating was done according to standard methods entirely. The method of collection was a method that was recommended to us by Mr. Whipple.

Q. Mr. George C. Whipple?

A. Yes, Mr. George C. Whipple.

Q. And were the other parts of the procedure recommended by any association?

A. Yes, all the rest are what they call standard methods.

Q. Prescribed by what body?

A. Well, it is the standard method of the American Public Health Association, generally recognized as a body capable of outlining standard methods in bacteriological and chemical work.

Q. After you had made the bacterial count and the tests for the B. Coli, did you record them at the time?

A. I did.

Q. Then what did you do next?

A. The counts were put on the record sheets made out, as I made

the counts, and they were sent over to the Commissioner, handed to Mr. Provost, Secretary of the Metropolitan Sewerage Commission.

Q. And these reports, how do they appear, in what columns in that tabulated form of complainants' Exhibit No. 12?

A. The numbers of bacteria are given in column 5 under the heading bacteria per c. c.

Q. What is that "per c. c."?

A. Per cubic centimeter. The *the* results of the Coli determinations are in the following two columns——

Q. Being columns what?

A. 6 and 7.

Q. Of the tabulated report which is known as Exhibit No. 12?

A. The B. Coli results are given in columns 6 and 7 under the heading—Dextrose, 24 hours, present B. Coli in Column 6 per one cubic centimeter and in column 7 per one tenth cubic centi-
1102 meter.

Q. Were those two different dilutions that you worked in?

A. Yes, the one cubic centimeter is not a dilution at all. That means one cubic centimeter of the original sample of water was placed in a fermentation tube.

Q. And the next column, was that a dilution?

A. That means a dilution, yes.

Q. A dilution of what?

A. One tenth of a cubic centimeter. It means placing one cubic centimeter of the water in nine cubic centimeters of sterilized water, shaking it thoroughly and taking one cubic centimeter of that and putting it in a fermentation tube.

Q. Did you do that work yourself personally?

A. Yes, I did it all.

Q. And reported it as you have testified?

A. Yes.

Q. And have you compared the work as it appears in these 23 sheets in complainants' Exhibit No. 12 with the original report and original notes made by you?

A. I have.

Q. And found it how?

A. I found it to agree.

Mr. O'Sullivan: Your witness, Mr. Riker.

Cross-examination by Mr. Riker:

Q. Were you present at the taking of all these samples that you analyzed?

A. I was present at a majority of them. I would not say from my memory way back in 1907 that I was present at the taking of every sample, but as far as my memory goes I did take them myself, everyone of them, but I would not be positive on that. There might have been a few that were taken while I was working in the laboratory. Yes, I will modify that. I will change that and swear that I took them all. When I spoke first I was thinking of the

muds. In the case of the water samples, I took every sample myself.

Q. And that includes the samples from No. 12 to No. 931?

A. Yes.

1103 Q. When you took them did you keep a memorandum of the fact and as to the place of taking them?

A. I did.

Mr. Riker: I called for that original memorandum.

Mr. O'Sullivan: Have you got it here, doctor?

The Witness: The memorandum is in the form of note books, field books, it is here, yes.

Mr. O'Sullivan: Show them to Mr. Riker.

The Witness: You can see them but I do not want to put them in evidence, because we keep them in our room.

Mr. Riker: I do not know how you are going to help it.

The Witness: I am perfectly willing that you should see them, but I am not going to put them in evidence. We will give you copies of them.

(Witness produces records).

Q. I show you a book that is marked on the outside Metropolitan Sewerage Com. of New York, 17 Battery Place and the figure 4. Are the memoranda in pencil in that book all in your handwriting?

A. They are, with the exception of a corrected figure here and there. Where you see a large figure like that (indicating) the rest is my handwriting. There was a re-arrangement,—marked in the large heavy pencil. It is all my handwriting with the exception of the numbers of the samples which were changed owing to the mistake probably on my part in numbering the samples.

Q. Now the paper which has been marked Exhibit No. 12 in the cause, did you have any part in making that up?

A. I did not. I simply went over it after it was made and compared my original reports with the data.

Q. And are there any other original data made by you?

A. There are.

Q. Except that contained in this book?

A. Yes.

1104 Q. What are they?

A. They are the reports.

Q. Where are they?

A. The laboratory reports.

(Witness produces two laboratory reports.)

Q. Here is a folder which I show you marked "Water, bacteriological, 1907?

A. Yes.

Q. Are those the reports that you refer to?

A. That is not in my handwriting on the folder, but otherwise it is my handwriting.

Q. But the reports, look at them, are they all in your handwriting?

(Witness examines report.)

A. I have been over these a number of times and they are all in my handwriting.

Q. Now, is there any other memorandum with reference to this work except in these books and in these reports?

A. Nothing else that I know of.

Q. And so far as Exhibit No. 12 is concerned, all that you have done or known about that is a comparison with these original reports and memoranda?

A. I have compared my original reports with the data as given in this complainants' Exhibit No. 12 and find that the results agree.

Q. That is all you have done with reference to Exhibit No. 12, is it not, made a comparison with your original report?

A. I compared that and found the reports agree.

Q. That *is* all you did?

A. I did not make up the reports, no.

Q. Is that all you did with reference to it, Exhibit No. 12?

A. That is all I have had to do with Exhibit No. 12, comparing the results.

Mr. Riker: It appearing now, that the original memoranda are in existence and are produced before the commissioner, I shall move to strike out all the testimony with reference to Exhibit No. 12, for the reason that the originals are the best proof.

1105 Mr. O'Sullivan: Complainants' Counsel desires to reply that the originals to which witness has testified as having compared Complainants' Exhibit No. 12 with, and found to be correct, that these original reports and note books are not at the disposal of complainant to offer in evidence, and for that reason a carefully compared copy of results is offered in evidence as the only intelligible way to present the aggregate of the work of which this witness' portion was a material element, and it would be unintelligible if it was simply taken by itself and not in conjunction with the chemical and other work done, and which appears in the tabulation in Complainants' Exhibit No. 12.

Mr. Riker: One or two more questions.

By Mr. Riker:

Q. Did you make the bacterial count yourself?

A. Yes, I did.

Q. In all cases?

A. Yes.

Q. Did you make any attempt to determine the character of the bacteria?

A. I did not. That is to say—I will modify that, with the exception that I have already testified to making tests for B. Coli and of course B. Coli being a distinctive type of bacteria, an attempt was made then to determine the species.

Q. In the case of B. Coli did you attempt to determine the number of that particular micro-organism in the samples?

A. The number was not recorded but it was recorded in the usual way of a positive or a negative fermentation tube.

Q. Is that a simple method of determining the actual presence in the sample?

A. It could be used in a quantitative way, if it was present, you could assume there was one there, that is all.

Q. That is all you could assume?

A. That is all.

Redirect examination by Mr. O'Sullivan:

Q. Doctor Parsons, I show you complainants' Exhibit No. 14, being data relating to mud samples No. 1 to 705 from New
1106 York Bay and vicinity examined by the Metropolitan Sewerage Commission in 1907, this exhibit containing sheets 1 to 17 inclusive, and I ask you if any of the work that you did during the year 1907 appears in that exhibit?

A. Yes.

Q. Under what columns in the tables that appear in that exhibit is your work recorded?

A. Columns 5, 6 and 7.

Q. With what headings to these columns?

A. Column 5 is headed bacteria per gram. Columns 6 and 7 are headed representing the B. Coli, column 6 for one tenth cubic centimeter, and column 7 one cubic centimeter.

Q. Have you compared the tabulated recording of your work as it appears in Complainants' Exhibit No. 14 with your original notes and reports, recorded and reported at the time of making these determinations in 1907?

A. Yes.

Q. And how have they compared?

A. They agree.

Q. Were you present when these samples of mud were taken?

A. I was not present when all the samples of mud were taken, no.

Q. Those samples that were taken — your presence, how were they taken, Doctor?

A. They were collected by means of a dredge and by methods already described by Dr. Merritt. Is it necessary for me to go into the details of the apparatus?

Q. No, I do not think so, unless Mr. Riker wants it?

A. Mr. Merritt has already testified as to the apparatus. I used the same as was previously testified to.

Q. What did you do after bringing the samples of mud to the surface of the water or bringing them to the boat?

A. Then, of course, in the case of bacteriological samples, the outer layer of the exposed mud was removed by a sterilized knife and the sample was taken in the sterilized—copper or brass, I forget which—plungers, and put into sterilized test tubes containing sterilized cotton plugs, and removed to the laboratory for analysis.

Q. For what did you examine the samples of mud?

A. The samples were examined for the total numbers of bacteria and for the presence of B. Coli.

1107 Q. What methods did you employ in making these tests and examinations of mud?

A. The methods used were the *mode* was taken——

Q. I do not mean in detail Doctor?

A. The methods used were, so far as plating went, the methods of the standard methods of the American Health Association. The method of removing the sample, the original from the test tube and placing it in a dilution, has already been testified to. I will go into that again if you care to have the details. It is an ordinary procedure. If think it is not dealt with in the standard methods. It is the ordinary procedure, the ordinary method of testing samples of mud.

Q. And recognized so in the profession by bacteriologists?

A. Yes.

Q. Who made the bacteriological examinations of those samples of mud?

A. I made them.

Q. That are set forth in the Complainants' Exhibit No. 14?

A. I made them.

Q. Personally?

A. Yes.

Q. Have you compared the records of the bacteriological work as recorded in the complainants' Exhibit No. 14 with the original notes and the original report made by you in 1907?

A. Yes, I have.

Q. How do they compare?

A. They agree.

Q. Dr. Parsons, did you participate in these float observations?

A. You will excuse me taking my time in answering, because I have been with the commission ever since it started, and I have taken part in float observations, but without consulting my notes, I could not say whether I did in 1907 or not.

Q. Will you look at your notes, Doctor?

A. Yes. (Witness examines notes). I can say in answer to that question that I went along in a minor capacity. I did not take any notes. I was simply what was called an assistant on some of the tests.

1108 Recross-examination by Mr. Riker:

Q. You say you have compared certain columns of exhibit No. 14 with your original notes?

A. Yes.

Q. When did you make that comparison?

A. I made that comparison while you were out to lunch.

Q. How did you make it?

A. I made it by comparing the two side by side.

Q. Did any one read them off to you?

A. They did not.

Q. Did you read them off to any one else?
A. No.
Q. Did you compare every item?
A. I did.
Q. During the recess?
A. Yes.
Q. You have the originals?
A. I have the originals, yes.
Q. Have you got them now?
A. Yes.
Q. Do they consist of original memoranda in note books the same as the water samples?
A. The comparison was a comparison of the columns that I have testified to, just the columns in the original reports and the column as given in this exhibit.
Q. Did you have the original memoranda in note books?
A. The columns did not call for anything except what I compared with the original reports, not the note books, but the original reports sent by me to the commission.
Q. Did any of the samples of mud receive an entry in the book?
A. Yes.
Q. You have got those?
A. Some of them, as I testified to. Some of them were original memoranda.
Q. And those original memoranda that appear in such note books, what were they of?
A. I am testifying as to the bacteriological results.
Q. I am asking what was in the original note books Doctor?
A. Well, the original note books they are cases where my comparison was of my result along corresponding lines.
1109 Q. They contain the bacteriological count?
A. I did not mean to testify that I compared the result of Mr. Miller or Mr. Merritt. I compared my result, my bacteriological results.
Q. Now did your original memoranda and note books contain the original bacterial counts made by you of the samples of mud?
A. Never.
Q. What did they contain?
A. The reports sent to the office on the sheets contained the bacterial results which I compared with the exhibit.
Q. What was it in the note books?
A. The note books were simply field notes.
Q. Of what?
A. Giving the number of the sample and the data regarding collections.
Q. You did not compare that column in Exhibit No. 14?
A. I did not compare those field notes. I compared my columns, bacteriological results which I was responsible for, and not the field notes.
Q. How did you identify—how do you identify the results of your bacterial work with samples that you collected?

A. Because my reports on the results are given fully on the sheets from the field notes.

Q. Then your reports are made up in part from your field notes?

A. The reports give the main details, the point of collection, the number and results, the bacterial results, so that the identification is very simple. All in a line.

Q. Yes, but when you made up your original reports did you take these details from your original note books?

A. Those reports as to the field notes I made from the note books, yes, sir.

Q. So that your original report so called is the result of field notes and bacterial counts are they not?

A. The original reports?

Q. Yes.

A. The original reports contain the sample number and the location number and the numbers of bacteria and the B. Coli
1110 results.

Q. And the first two items were taken from your memoranda of field notes, were they not?

A. Yes.

Q. Have you got the original reports here?

A. Yes, sir. I can read them.

Q. Those were the ones you showed me in a folder. Those are the water samples. I show you folder marked Mud Bacteriological, 1907. Will you look at the contents of the folder, and say whether or not those are the reports the original reports on the mud samples that you refer to?

A. Those are the ones, yes.

Mr. Riker: I object to the use of the copy when it appears that the originals are here.

The Commissioner: Note the objection.

Mr. O'Sullivan: The copy was offered and marked in evidence by complainants' Counsel because it contains the accurate compiled data, not only of the bacteriologist, but of the chemist who did the other determinations, and with the assimilated data from both sources together with the temperature, the locations and other data, and without those facts that are thus recorded in Complainants' Exhibit No. 14, it would be unintelligible. If recorded in isolated form and without other necessary data upon lines of value and significance to their tabulated form.

Mr. O'Sullivan: That is all, Doctor.

DAVID S. MERRITT, a witness, called on behalf of complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. When you were on the stand before recess, Mr. Merritt, you identified the original tracings which contained the locations of the water and stations which you have plotted?

A. Yes, sir.

1111 Q. On the original map?

A. Yes, sir.

Q. Comparing blue prints which I now present to you with the originals and see if there your figures are recorded in the plottings there?

Mr. Riker: Are the originals here?

Mr. O'Sullivan: I am having three more copies made.

Mr. Riker: You are asking him to compare them, Doctor. I do not see how you can compare them when he has not the originals here to compare with.

Mr. O'Sullivan: They have his own signature on each one of these.

(Witness examines blue prints).

Mr. O'Sullivan: I will amend the question by striking out the word "comparing" and substituting "examining."

The Witness: Those are blue print copies of the tracings I examined this morning.

Q. Do you feel sure those are blue prints?

A. Of the original tracings, yes.

Mr. O'Sullivan: I offer those in evidence.

Mr. Riker: The offer is objected to on the ground first because if it does not appear that the witness has actually compared them with the originals, that he himself has made the blue prints or been present when they were made, on the further ground that they do not contain any facts which have yet been testified to and proved and third on the ground that they are immaterial, irrelevant and incompetent.

The Commissioner: Note the objection.

Mr. O'Sullivan: I offer those sixteen blue print- of the original tracings, which I am debarred from putting in evidence, as
1112 they are parts of a public record, and ask that they be marked as Complainants' Exhibit No. 18.

Mr. Riker: The objection is renewed on the grounds stated.

The Commissioner: The objection is noted.

Marked Complainants' Exhibit No. 18.

By Mr. O'Sullivan:

Q. Mr. Merritt, directing your attention to Chart No. 1 of Complainants' Exhibit No. 18, I ask you what the various figures or numerals appearing on that chart represent or stand for?

A. The little numerals that you see there, that is the depth of the water. Those are copies of the Government charts. This is a copy direct off from *from* the Government chart. It is a tracing of the Government chart, and those little figures that you see there are the depth of the water, but not all depths, as shown on the Government chart, but most of the depths.

Q. How are the water and mud stations or locations indicated on the maps?

A. They have a little round circle and the figure is put inside. For instance like that one (indicating).

Mr. Riker: Is that for both?

The Witness: No, where there is a water sample.

Q. The number of the station or the number of the sample——

A. I think it is the number of the sample, I am not sure. It is so long ago. Whether that number is of the sample or of the station.

Q. Are those figures or numerals written in your handwriting?

A. Most of them I think are in my handwriting.

Q. Those with the circles?

A. With the circles. In plotting these, I had some help from an assistant, but I think most of the stations themselves are all in my handwriting. There might be some of this other work that was in the assistant's handwriting.

1113 Q. Look at the second chart, Mr. Merritt?

A. That was done in the same way. The circles indicate the stations.

Q. Look at the third chart, Mr. Merritt?

A. That was in precisely the same way.

Q. And those plottings were done by you?

A. Those original plottings were done by me. Of course on the Government Map they do not have these squares. That is my work, dividing it off into squares about a mile square approximately, and they correspond to that fraction of a degree of longitude and latitude indicated.

Q. Those square subdivisions were all made by you?

A. Yes, every one of them.

Q. And those figures in circles were plotted by you?

A. By me, yes, sir.

Q. And what do they represent?

A. They represent either the sample or the station number, I have forgotten now which it is. Either the station or the number of the sample, I have forgotten which.

Q. And would a reference to your note book inform you on that?

A. I do not know whether it would or not. (Witness examines note book). Those evidently are the water samples.

Q. Or the stations?

A. Or the stations, yes.

Q. Which is it, Mr. Merritt?

A. I should judge from this book it was the water sample itself. I am not sure about that though. No, I am wrong, it is the location of the station, and then those samples are taken at that station, samples of water.

Q. Then those figures?

A. Represent the locations of the stations.

Q. Of the stations?

A. Yes.

Q. Now those are the figures with the circle around them?

A. With the circle around them, yes.

1114 Q. And the station where you do what?

A. Where we took the different samples of mud, samples of water, either one.

Q. Look at Chart No. 5, Mr. Merritt, and say if the plottings on that chart were done by you?
A. Yes.
Q. Done by you?
A. Yes.
Q. Look at Chart No. 6?
A. Yes, sir, that was done by me.
Q. The plottings were done by you?
A. Yes, sir, except those small numbers indicating the depth. I probably did not do that.
Q. I am talking about the plottings?
A. The station numbers were mine.
Q. Were done by you?
A. Yes, sir.
Q. Taking up Chart No. 7, Mr. Merritt, who did the plottings on that chart?
A. Those are all my plottings.
Q. They were done by you?
A. Yes, sir.
Q. Personally?
A. Yes, sir.
Q. Taking Chart No. 8, Mr. Merritt?
A. Yes, sir.
Q. Who did the plottings on that chart?
A. I did, personally.
Q. Chart No. 9, who did the plottings?
A. I did.
Q. Chart No. 10?
A. Yes, sir, I did that.
Q. Who plotted the location indicated on Chart No. 10?
A. I did that.
Q. You did that personally?
A. Yes, sir.
Q. Chart No. 11?
A. I did that.
Q. You did the plottings on Chart No. 11?
A. Yes, sir.
Q. Chart No. 12?
A. Yes.
Q. Who did the plottings on that chart?
A. I did those.
Q. Personally?
A. Yes, sir.
Q. Chart No. 13, Mr. Merritt, who did the plottings on that chart?
A. I did those.
1115 Q. Chart No. 14, who did the plottings on that chart?
A. I did those.
Q. Chart No. 15?
A. Yes, sir.
Q. Who did the plottings on that chart?

A. I did those.
Q. Chart No. 16?
A. I did those.
Q. Did you do those personally?
A. Yes, sir.
Q. Then on the sixteen charts composing Complainants' Exhibit No. 18, who did the plottings of the locations from which these samples were taken?
A. I plotted them all.
Q. Personally?
A. Personally, yes, sir.

Mr. O'Sullivan: I have got the man here who made the prints from the original tracings. Do you want me to go as far as that?
Mr. Riker: Doctor, I cannot determine what you shall do.

MAX L. BERREY, a witness called on behalf of complainants being first duly sworn, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Mr. Berrey have you given your full name?
A. Max L. Berrey.
Q. Are you employed by the Metropolitan Sewerage Commission?
A. Yes, sir.
Q. Did you in accordance with instructions given by the Metropolitan Sewerage Commission bring any original tracings or charts here today?
A. Yes, sir.
Q. What did you do with those, after they had been used in the course of the hearing here?
A. I was instructed to take them, a set of sixteen tracings, to be blue printed.
Q. Where did you take them?
1116 A. I took them to the New York Multicolor Printing Company.
Q. At what time?
A. At about one o'clock.
Q. Today?
A. Today.
Q. And what did you state in reference to them?

Mr. Riker: I object to it as hearsay and immaterial.
The Commissioner: Note the objection.

Q. What orders or instructions did you give in regard to them?

Mr. Riker: The same objection.
The Commissioner: Note the objection.

A. I ordered the Multicolor Company to make up a complete set of blue prints from these tracings, sixteen tracings.
Q. Did you call at the Multicolor Company later in the day?
A. Yes, sir.

Q. At what time?
A. At 2.30.
Q. And did you bring anything away from there?
A. I brought a complete set of blue prints from those tracings.
Q. I hand you Complainants' Exhibit No 18, comprising sixteen charts and ask if those were the blue prints that you brought from the Multicolor Company, and were the copies of the tracings that you took there *seom* time——

Mr. Riker: I object to it as immaterial and irrelevant.
The Commissioner: Note the objection.

A. I find there is a complete set of blue prints from the tracings which I delivered to the Multicolor Company.
Q. And did you bring this set of blue prints, these sixteen charts, known as Complainants' Exhibit No. 18?
A. I did.
Q. You brought them yourself personally?
A. Yes, sir.
1117 Mr. Riker: Did you compare them with the originals?
The Witness: I did not.

Mr. Riker: That is all.

At 3:30 P. M. adjourned to November 29th, 1911, at 10.30 A M.

1118 Supreme Court of the United States, *November* Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
vs.
THE STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

Corporation Counsel's Office, Hall of Records.

NEW YORK CITY, November 29th, 1911—10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances:

Dr. William J. O'Sullivan, Special Counsel for the People of the State of New York, Complainants.
Joseph Coult, Esq., and Adrian Riker, Esq., of Counsel for the Passaic Valley Sewerage Commission, Defendants.

DAVID S. MERRITT, a witness called on behalf of complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Mr. Merritt, you had before you yesterday, the original tracings that you testified to relative to locating the stations from which you had obtained samples of mud and samples of water?

A. Yes, sir.

1119 Q. I show you now Complainants' Exhibit No. 18, which has been testified to as blue prints made yesterday from these tracings, and I ask if you identify the figures on that as exact duplications of the figures made by you in the original tracings?

(Witness examines blue prints.)

A. They are all duplications except two.

Q. And whose figures are those two.

A. I do not recollect. They are on page 15.

Q. Chart 15?

A. Yes. The original, there is drawn a pencil line through that, and the number changed from 3 something *yo* 2 something. Evidently the original station as I put it was wrong, and it should have been two instead of 3. I am not sure whether that is my writing on top.

Q. In the two isolated instances on Chart No. 15?

A. Yes. You see the record shows it *be* be 3.49, where it should have been 2.94. I am not absolutely sure that those above that are my figures.

Q. But they relate to the serial numbers of the location?

A. Yes.

Q. Did you find anything else here that was not yours?

A. That is a duplicate of mine, yes, sir.

Q. Everything with the exception of those two that you have expressed some doubt about?

A. That I have some doubt about, yes. I am not sure about that.

Q. Are there any marks of identification on the original tracings as reproduced in these blue prints that you recognize such as signatures?

A. I recognize my own signature on all of these. Of course when I looked them over, I looked carefully to see that the latitude and longitude from the original was right. I see it is. When I looked it over yesterday, I looked for the yellow lines, and I also looked for the stations in round circles, and also my signature. Those appear to be all correct, yes, sir.

1120 Q. Did you witness the Commissioner sign his name to the original tracings yesterday?

A. I did, yes, sir.

Q. Do you find his signature on these blue prints reproduced?

(Witness examines blue prints)

A. I do, sir, but they are rather faint in the reproduction, but they are reproduced all right.

Q. Do you find your own signature on each one of these blue prints?

A. I do, yes, sir.

Q. In the whole series of sixteen charts marked as Complainants' Exhibit No. 18?

A. I do, that is a copy of them.

Q. Mr. Merritt, how were these maps prepared by you, the original tracings?

A. The original tracings were made as original maps. In preparing this the Government chart of course was the basis of the original tracings. The Government chart has certain indications on it where you can get the latitude and longitude from that, so that the map when we got through with it, the original map the Government map was blocked off into large squares.

Q. By whom?

A. By myself, both the latitude and longitude. Those squares, as I remember, were cut up in smaller sections, and from that one, the cut-up map, the tracings were made on that cut- up map by my assistant and myself.

Q. Who was your assistant?

A. James Losee. The circles indicating the stations at which the samples were plotted were put into the maps by myself.

Q. Personally?

A. Personally and the numbers drawn into them. In addition when we got it in on the small map, the latitude and longitude, the larger squares were subdivided on the small maps, making them original maps. That subdivision work was done also by Mr. Losee and myself, and I think Mr. Losee did the work in my office under my personal direction. I was with him all the time when he was doing that work. His work relates to tracing the outline of
1121 the shore lines and the information as to the depth, those little figures relating to the depth of the water at different points.

Q. I see dotting all over the face of the water area of the chart, small numerals?

A. Yes.

Q. What do those indicate?

A. Those indicate the depth of the water at those points.

Q. Now the figures in large numerals and enclosed in a circle, what do they indicate?

A. Those indicate the stations at which we took either samples of mud or samples of water or both.

Q. And those are the serial numbers?

A. Those are the serial numbers, yes.

Q. For purpose of locating the stations at which the samples were taken?

A. Were taken, yes.

Q. I see numerals along the margin of this chart; what do they indicate?

A. Those indicate the latitude and longitude of those cross lines on this.

Q. Those station locations which are plotted on these charts testified to by yourself, how were the locations determined?

A. Usually by a sextant. That was not always the case. For instance along the river, the North River or the East River or the Harlem River where it was very close to the shore, for instance only a few feet from the shore, the number of the station was estimated, the approximate distance was estimated from the bulkhead line for instance. For instance if it was about pier No. 3, or No. 5 or No. 7,

we would say in front of Pier No. 5 or No. 7, to a certain distance on one side of Pier No. 7. Often, we took them very close to the pier, close to the shore, but usually in the bay, when there was any question as to the precise location it was taken by a sextant.

Q. And is the sextant the appropriate implement to make these locations by?

A. I should say it was, yes, sir. You get a fairly close ap-
1122 proximation of the distance, the location of the point.

Q. In your profession you are called upon to measure distances approximately with your eye?

A. Yes, very —, very often we have to do that, estimate approximate distances.

Q. And your eye has been trained with a view to making these approximate determinations?

A. Yes.

Q. What measure of care as to accuracy did you employ in determining these locations?

A. Why, the actual reading of the sextant was taken at these points, and usually several sextant readings were taken at one station. As a matter of fact to be sure of the location, I aimed to take two points, which were well established on the shore line and got in line with those two points and *take* the sextant readings for those two points, two different points.

I would also be sure of being in line with certain definite points located as I had the other points, which would very closely approximate the point at which I was *taken* the observation.

Q. Mr. Merritt, I hand you complainants' Exhibit No. 4, Complainants' Exhibit No. 5, Complainants' Exhibit No. 6, *Complainants' Exhibit No. 6*, Complainants' Exhibit No. 7, Complainants' Exhibit No. 8, Complainants' Exhibit No. 9, Complainants' Exhibit No. 10, Complainants' Exhibit No. 11, which have been testified to as containing 27 float observations. I ask you how many float observations you were present at and directed?

A. I have forgotten the exact number unless I look at a list that I prepared (witness examines list) 27.

Q. Will you state how these float observations or experiments which were conducted by you during the year 1907 *where* directed?

A. In regard to the floats themselves?

Q. Just describe the modus operendi?

A. The float—do you want a description of the float?

Q. Yes, a description of the float, and of the way the
1123 whole procedure was managed under your direction, and under your personal observation.

A. The floats were built according to my direction. In fact, I helped to build them. It was a home-made concern, made by the captain and myself. They consisted of four metal vanes. These vanes, if I remember rightly, they were two feet high, each one, and each one was about one foot wide, or a little over 1 foot wide. I am not quite sure of the exact width. They were nailed to a 2 inch stick, and at the top of the stick—so that they stood at right angles

to each other, made a cross—at the top of the sick we bound fast or nailed fast a cork and adjusted it, so that in still water the top of the cork would just balance the iron work so that it just kept to the top of the water. I might say there was also a little one half inch stick about I should say from 18 inches to 2 feet high, about one half an inch in diameter, nailed fast to the other stick. On this little stick was a little red flag; this we weighted so that they would come just above the water. The larger part of the two inch stick and the piece of cork would just come to the top of the water, probably stick out of the water probably three quarters of an inch. The entire stick above that of course stuck out with the flag. They were so weighted, and cork was so adjusted, that the cork came just to the top of the water. These floats were taken out and the iron vanes on the bottom of the float so arranged that the bottom of the vane would be 5 feet below the surface of the water and the top of the vane would be three feet below the surface, the vane being 2 feet in height. These floats were taken out in this manner and thrown overboard at different locations and at different times. The way in which the tide was flowing the way in which the wind was blowing—as near as we could judge about the velocity of the wind, that was taken at the time. We would follow the floats and
1124 take observations. During the latter part of the time we took sextant observations of the float and where they flowed up and down. The first few times we did not take sextant observations. The approximate points were estimated, off a certain point on the shore as being opposite such and such a point at such a time, and approximately so far off. We followed them until the tide turned and they started to come back again.

Q. What started to come back?

A. The float. For instance if it was put in on the flood tide, we followed it up the river until it would begin to turn and come down again. If it was put in on the ebb tide, possibly at the beginning or before the beginning, it would go up a little and then come down again. By the time it turned to come back, we would pick it up and put it in the boat again. It would actually take practically all day to do that. That is the general method of taking these float observations.

Q. What did you do as to your observations of the float, did you make notes of them?

A. We made notes in books, yes, in note books. I made those notes. I think that those were given in all the note books. The list I had in my pocket was the times that I was on, as to the other notes taken when I was not on I would not be sure about.

Q. These 27?

A. Yes.

Q. In this exhibit that I have handed you?

A. Yes, that covers those.

Q. Now in recording the pathway taken by the float, did you make any tracings?

A. The original pathway of the float I plotted on a Government chart, and then had my assistant trace the original chart and put

on the different colors for different days so that they could be distinguished.

Q. Who was that assistant?

A. Mr. Losee.

1125 Q. Did he do this under your direction, under your personal observation and direction?

A. Yes, sir. He was right in the room with me at the time. He was making these charts, and if there was any question came up, he would consult me, and we did the work practically together.

Q. He was in your office all the time?

A. All the time, yes, sir. He has been in my employ continually up — the present time.

Q. Did you have an opportunity to see those field note books made by you in 1907 yesterday?

A. I did, yes, sir.

Q. And you have looked through these exhibits that I have handed to you, you looked through them yesterday?

A. I looked through these yesterday. I will go over them once more. (Witness examines exhibits).

Q. You have now completed your examination of Exhibits Nos. 4 to 11, have you?

A. I have, yes, sir. I wish to correct my testimony. The original was plotted on the Government charts, and these prints were made from those tracings. All of these prints, the original work was traced over again.

Q. By whom?

A. By Mr. Losee.

Q. This is Mr. Losee's work?

A. Yes, this tracing is Mr. Losee's work. He had the original to direct him in making these.

Q. The original was prepared by you?

A. The original that was prepared by me.

Q. And these were prepared under your direction and personal supervision?

A. Yes, sir.

Q. In making each one of these float observations and experiments, was it your object to secure a period of time covering a whole tide as nearly as possible?

A. That was the idea, yes, sir. I wish also to correct my testimony in regard to these. I stated last that tracings were made of these. Those tracings were made in such a way that they

1126 was considered as a part of the original work. The tracings of the outline of the land was done from the Government Map by Mr. Losee. Then the original was—putting these in afterwards in the original print of the tracing. The tracing only referred to the tracing of the Government Map—only to the tracing of the Government Map, and the work of plotting it on to this print of the tracing of the Government Map, that was considered as the original map, the tracing onto that.

Q. So that these exhibits that I hand to you are really originals?

A. The original maps, that is the idea. The tracing was of the

Government Map, and that was used as a basis, and the plotting on to that and the tracing of the work was actually the original map. These actually then are the original maps on which the tracings were plotted.

Q. Now when a float grounded or collided with any object on the shore, what did you do?

A. As a usual thing, I think always when the float landed ashore or collided with something that stopped its progress, we picked the float up from where it ran ashore and took it out into the stream, possibly one hundred or two hundred feet, as the case might be, as is noted in the note books.

Q. You restored it to the main current again?

A. Yes, sir. I believe in one or two instances, floats were lost. They would run under the dock, and would not come out, so after waiting two or three minutes if it did not come out, we would launch another float in front.

Q. There were other float observations besides those recorded here which were incomplete, I understand?

A. Yes, I believe that is the case.

Mr. O'Sullivan: I think that is all.

Cross-examination by Mr. Riker:

Q. Mr. Merritt, do you think your studies of rhizopoda
1127 and algæ qualified you for the work you have been testifying on or have been doing?

A. I think my study of chemistry and bacteriology did qualify me for the work I was doing.

Q. I did not ask you that; I asked you if you thought your study of rhizopoda and algæ qualified you for the work you were doing?

A. That had no particular connection with it other than that I did make examinations of the work for parts of algæ.

Q. Have you testified that you made any such examination?

A. No.

Q. But you did make determinations for algæ?

A. Yes, sir.

Q. In this particular matter?

A. Yes.

Q. And was that reported in any of the reports?

A. That was not reported in any of the reports.

Q. Are you still in the employ of the Metropolitan Sewerage Commissioners?

A. I am not, no.

Q. When did you cease to be connected with them?

A. The last work I did for them was in 1909, I think, possibly it might have been in January 1910, but about that time. It was during the entire year of 1909, a part of 1908 also.

Q. When did you begin your connection with that body?

A. Very late in the Fall or the early winter of 1906.

Q. When did you begin to take samples of the waters of the Harbor of New York?

A. These were taken early in 1907.

Q. How many samples did you take yourself?

A. I cannot tell the exact number.

Q. Did you take them all?

A. I was present when—not all of them, but when nearly all of the samples were taken.

Q. How many were there taken that you were present at?

A. I do not know how many. I think nearly all.

Q. Well, what do you base that thought upon, Mr. Merritt?

A. Because I usually was with the boys when they did that. I was actually engaged in taking the samples myself.

1128 Q. Have you gone over them to see how many there were that were taken when you were not present when they were taken.

A. No, I have not gone over them to see how many were taken when I was not present.

Q. How many were taken when you were there altogether, if you know?

A. What do you mean by that question?

Q. Just what I say.

Mr. O'Sullivan: I object to that question as indefinite.

Mr. Riker: If the witness cannot answer he is at liberty to say so. Please do not interrupt the cross-examination unnecessarily.

Mr. O'Sullivan: I will every time you make an indefinite or ambiguous question calculated to mislead the witness.

Q. How many samples of water were there taken altogether?

A. About one thousand.

Q. And you cannot tell how many of those you were present at the taking of?

A. No, very nearly all, but I do not remember the exact number.

Q. How many persons were engaged in the taking of the samples?

A. What do you mean, the boat hands?

(Question repeated by the stenographer).

A. Usually a boat hand would pull up the bottle for me. I usually would disengage the bottle from the cage and label it and put it into the basket and bring it ashore. If they were bacteriological samples, I usually brought up the sample myself from the depth, and took it into the boat personally. Mr. Parsons usually was in the boat with me.

Q. What memoranda did you make at the time of taking these samples?

A. We noted the place at which they were taken and the samples

from which they were taken, and usually the temperature
1129 of the water from which they were taken.

Q. You say usually, did you note the temperature of the water?

A. Yes.

Q. Do your note books show?

A. Yes, they show.

Q. Where are these books?

A. They are here somewhere, I do not know where.

Mr. Riker: I ask that they be produced.

Mr. O'Sullivan: In response to counsel's request, counsel for complainants produces the original field book and note book made at the time of the observations.

Q. Do these books which are nor produced contain your memoranda?

A. Most of it.

Q. In your handwriting?

A. Yes, sir. Very often in going out with the boat, when we were taking samples, I would set down the work myself, and Doctor Parsons would set it down, when we were both doing the work together, and some of that may be in his handwriting and some may be in mine.

Q. And the memoranda that are not in your handwriting, did you compare it to verify it at the time the memoranda were made?

A. I usually did that part of the work.

(Question repeated by the stenographer).

A. At the time, we both did that work together in taking down the number of the sample, the temperature of the water and the direction of the wind.

Q. When Dr. Parsons made the memoranda, did you verify it?

A. I do not understand what you mean by verifying it.

Q. Do you not understand what the word "verify" means?

A. I know what it means, yes.

Q. You cannot answer the question?

A. I do not know what you mean when you ask the question.

Mr. O'Sullivan: I object to the question as clearly indefinite. This witness testified that he dictated it, when he did not
1130 write it, and the assistant to whom he dictated it read back the matter dictated. If that is a verification, he has already fully answered your question.

Mr. Riker: He has not, but I suppose that is all the answer necessary for that.

The Commissioner: Note the objection.

The Witness: That is precisely what was done.

Mr. Riker: That is not what you said was done. The record will show, Mr. Merritt, what you said.

Q. Now, what else did you do at the time the samples were taken?

A. Brought them into the laboratory.
Q. What?
A. Brought them into the laboratory, and put them in the laboratory.
Q. That was after the samples were taken, was it not?
A. Yes.
Q. In whose possession are the original memoranda made by you as to the observations, at the time the samples were taken?
A. The Metropolitan Sewerage Commission, I suppose. I do not know. I turned them over to the Metropolitan Sewerage Commission.
Q. They are part of their records?
A. Part of their records.
Q. And they are the foundation, are they not, for the charts which have been testified to?
A. They are.
Q. And you have no other foundation for those charts except the memoranda?
A. Certainly not, why certainly not.
Q. When the charts were made did you compare the charts as made with your memoranda?
A. I made the charts myself, and then after making the originals, the first chart, they were all copied from that one, these individual charts. Do you refer to the float observations or what do you refer to?
1131 Q. I am asking you about the changes that were made as to whether you compared the charts when they were made with the original memoranda?
A. All of the charts were made directly from the original memoranda, and I made the charts myself. That is I made the plottings of the locations where the samples were taken on the charts.
Q. Where are the memoranda upon which you located the stations from which you took the samples?
A. Those note books.

Mr. O'Sullivan: Complainants' Counsel offers the note books and field books to defendants' Counsel for his use.
(Complainants' Counsel hands note books to Defendants' Counsel.)

Q. Those were the memoranda on which you plotted or located these stations on the map?
A. Certainly.
Q. Have you compared the locations as they appeared on the original map of the stations at which samples were taken with your note books?
A. I made the original plottings directly from the notes.
Q. Now in locating these stations will you tell me just what course you pursued?
A. In doing what?
Q. In locating the stations at which you took the samples?

A. I have already testified that out in the Bay sextant readings were usually taken. I am not sure that in all cases sextant readings were taken, I do not think they were. Where they were within a short distance from the shore, near the shore, the distances was estimated, the place of location, or the place where the samples were taken.

Q. On what data did you make your readings on the sextant?

A. On what data did I make my readings of the sextant, what do you mean?

1132 Mr. O'Sullivan: The question is objected to as meaningless.

Mr. Riker: That is probably the misfortune of counsel.

Q. What datum did you use for the reading of the sextant in any one instance?

A. What do you mean by "datum"?

Q. Don't you know?

A. No, not in that case, certainly not.

Q. All right, I will translate it for you?

A. I wish you would.

Q. At what object or point, did you direct your sextant in making the readings?

A. Points that were established on the Government Survey. For instance, there is Greenville Church; there is the Liberty Statue; there is the old Aquarium Building, as it is now; there is Castle William, that is another point. There are a number of those stations on the government map, on the government chart. They are shown on the government chart, and those are already on the map. By looking at those points and taking the angle between the point where the station was, you could locate yourself in the Bay.

Q. I am asking you whether that is what you did?

A. That is precisely what I did.

Q. Can you locate the data that was used by you on the Government map to say whether it is correct?

A. I used the Government Map in doing this.

Q. And you assumed its correctness?

A. I assumed that the Government Map was correct, of course. Of course my work is not correct if the Government work is not correct.

Q. Now what proportion of the stations did you locate by sextant readings?

A. I could not tell the proportion of the stations. Their numbers are in the note book. I cannot remember that point. I re-

1133 member a very large proportion of all the work done in the Bay a distance from shore, any considerable distance, was located by the sextant.

Q. Now in approximating by the eye, how many of the stations did you determine in that way?

A. I cannot tell that unless you examine the books to find out.

Q. What particular experience have you had in locating or determining distances by the eye when you were on the water?

A. Well, I had quite a good deal of experience. I cannot tell you my exact experience. We have -one a lot of work at Tarrytown in which observations were made in regard to the location of distances on the water. That is, distances up to four or five hundred feet. When it is over that we are not able to locate it in that way. It could be located—it could be located by two transits.

Q. And the locations of stations on the charts that you have been speaking of, did you make them by the eye up to a distance of four or five hundred feet from the shore?

A. No, usually one hundred or two hundred feet was the most. That applies with this exception, that some of the stations, for instance, where we would take a cross section of the river in taking the samples as from the Battery over to Communipaw, we would take them approximately at a quarter of the distance away from the shore, and at three quarter and a half distance, and then at either one or two hundred feet off the shore. In those distances of one quarter way across the river, one half way across the river, and one hundred or two hundred feet from the shore, that would approximate it.

Q. In taking the samples of the water, did you make any other observations than those which you have already testified to on this examination?

A. I have made other examinations. They are not in the record though.

Q. You did not attempt to determine the depth at which the samples were taken?

A. Yes, that is shown in the record.

1134 Q. How did you determine the depth at which you- samples were taken?

A. By a rope, measured it. As I stated yesterday we obtained the use of a patent cage, and used a very heavy cage, which for small samples from 12 to 15 pounds of lead were placed in it, and for large samples from 25 to 30 pounds of lead. That carried the line straight down independent of the velocity of the current.

Q. Why did you abandon the use of the cage?

Mr. O'Sullivan: I object to that as misleading. He says he abandoned the cage in favor of another cage. The question assumed that he abandoned cages of all kinds. I object to it on account of its indefiniteness.

The Commissioner: Note the objection.

A. I did not abandon the use of the cage.

Q. What did you abandon the use of?

A. I abandoned the use of one kind of cage.

Q. What kind of a cage was that?

A. It was a kind of cage that had a spring *it* the top of it that would allow you to pull a cork out and replace the cork.

Q. And what sort of a cage did you substitute for this?

A. I substituted a cage that was easily weighted, that did not

make a provision for replacing the cork in the bottle. It made a provision for pulling out the cork at the proper depth and bringing the sample up.

Q. Why did you abandon the use of the cage which you did abandon?

A. Well, it did not work good, that was the reason.

Q. What was the trouble with it?

A. It would not always put in the cork, and it was not heavy enough. It was too complicated in other words.

Q. It did not give an accurate sample?

A. Yes, it gave an accurate sample, except it was not
1135 heavy enough and it took too long to operate it.

Q. Well, the cage which you substituted for it, is that the recognized device for the urpose?

A. I do not know whether it is a recognized device or not. I do not know whether there is any recognized device for taking samples *samples* of water.

Q. Have you been in the habit of sampling water?

A. Yes, a great many samples.

Q. Besides these particular reports?

A. Certainly.

Q. Had you ever used the cage which you used in this case before?

A. Yes, I had used both cages before. I never had to weight the cages so heavily as I had to with those here.

Q. In taking the samples did you determine or attempt to determine the velocity of the wind?

A. The captain of the boat usually estimated the velocity of the wind.

Q. How did he do that?

A. He did it by guess work, what he knew about wind; probably a close approximation.

Q. Is there a scientific way of determining the velocity of wind?

A. Yes.

Q. You did not use that?

A. We did not have anything like that on the boat. It would be a nuisance to have that on the boat.

Q. I did not ask you whether it would be a nuisance?

—. I volunteered that.

Q. If it was worth taking at all, it was worth taking accurately, was it not.

A. No, it did not make much difference.

Q. It did not matter much whether it was taken at all?

A. It did not make much difference whether it was taken as far as these samples were concerned.

Q. Did it make any difference whether it was taken accurately?

A. No.

Q. Why not?

A It was unnecessary. It would not make any difference whether

it was one mile an hour or two miles an hour. That would
1136 not make any difference in the sampling of the waters.

Q. It was somewhat nonsensical to take it at all, was it not?

A. Not *not* necessarily.

Q. Well, you have made a note of it on your chart?

A. All the directions of the wind that were taken are noted in the books.

Q. I did not ask you about direction. I asked you about velocity?

A. The velocity of the wind, all that we took is noted in the books, yes.

Q. I say as to velocity, that was not noted on any of your charts?

A. I do not think the velocity of the wind was noted on the chart.

Q. It was nonsense to take that at all, wasn't it?

A. No, I do not think so at all.

Q. What good did it serve if you did not report it.

A. We did report it in our books. We did not put it on the charts. We took it merely as a precautionary measure.

Q. Now you were asked to examine certain blue prints?

A. Yes.

Q. Which have been marked as an exhibit?

A. Yes.

Q. And you testified that with the exception of two numbers they are exact duplicates?

A. I did that, yes, sir.

Q. Of the originals?

A. Yes, sir.

Q. Did you compare them with the originals at any time?

A. No, sir, I did not have to.

Q. How can you say that a blue print is an exact copy of an original without examining it?

A. I can testify to that better than if I did examine it. It is an absolute copy.

Q. How so?

A. Because it involves a chemical process that you cannot change.

Q. Could not that tracing have been changed before it was subjected to the chemical process?

A. That is the only question and I covered that very point by examining it.

1137 Q. How can you tell without examining and comparing it with the original?

A. I can tell by the looks of the blue print whether it has been changed or not. That is precisely what I looked for to see whether there was any change, to see if any figures were covered up or any other substitution made.

Q. Were there any other colored lines on the tracing?

A. Yes.

Q. And they are all reproduced?

A. They are.

Q. In color?

A. Not in color, no. It depends. The lines on the tracing prohibit the light penetrating the sensitized paper, and a yellow line in the paper will also blur, and a red line will not, and that is why I used yellow lines to distinguish. Wherever there was any kind of ink on the tracing it produces a white mark on the print, so that it is absolutely certain what the result is. There is no question about it. There cannot be any question as to the result unless the tracings were changed, and that is what I looked for to see if there was any change.

Q. When did you look at the tracing to see?

A. I looked to see if there were any changes on the print from the tracings.

Q. So far as you remember from the print that is produced here, you think there were no changes on the original tracing?

A. I do not say that at all. I say there was none.

Q. How can you say so?

A. Because I looked for them and there were none.

Q. You looked at the original tracings?

A. I looked at the blue prints and recognized every one of those figures and every one of the circles, the matters on the originals, and they would be the same unless some of them had been covered up and obliterated, and I looked to see whether any had been obliterated, and there we- not, and there were no changes in any way.

Q. How do you know the figures there are your own?

A. Because I made them. I know my own handwriting.

1138 Q. There are two instances on one of these blue prints on which you are not certain?

A. Where I was not certain about it, I would not testify about them.

Q. How are you so certain about the others?

A. I know about those. I am sure about those. Those I am willing to swear to. Anything that I was not absolutely certain about, I would not testify to.

Q. Now, after the samples of water were taken, which were taken, under your direct observation, what did you do with them?

A. After the samples of water were taken, by myself and under my direction, they were turned over to Dr. Parsons.

Q. Was Dr. Parsons on the boat at the time?

A. A good many time-, almost all the time, with me on the boat.

Q. And you turned the samples over to his custody then and there?

A. We both brought them into the office together, yes, sir.

Q. Now the ones that you did not turn over to him which were taken under your supervision or by yourself, what was done with them?

A. At certain times I did not go out with Dr. Parsons,—I would take the samples, or perhaps with Dr. Miller, I would take the samples. And sometimes Dr. Miller would take the samples. That was at the time when I was on the boat but——

(Question repeated by the stenographer).

A. If there were any, there were very few at the early stage of the proceedings, the early stage of the work. It is possible I may have taken samples myself and analyzed the samples myself. I do not know. I would not be sure about that.

Q. Was he present at all times when you were taking samples yourself, with the exception of those few you have last referred to?

A. I believe that Mr. Miller was present a few of the times. I think Dr. Parsons was always present in taking the samples of water, except possibly a few samples that Dr. Miller took in
1139 order to determine certain chemical contents of the water. I think Dr. Miller did take some samples in the North River to determine the chlorine. I did not go with him when he was taking those samples.

Q. You do not know about that?

A. I do not know about those samples, no.

Q. After the sample was brought up from the water, and it was turned over to Dr. Parsons, did you have anything further to do with it?

A. Not directly, no.

Q. Well, what do you mean by not directly?

A. What I mean to say is this: the entire laboratory was in my charge in a way. It was turned over to the Doctor and the Doctor did the work. It was merely in a supervisory manner that I had anything to do with it. That is all.

Q. As to any particular samples then, after it had been taken up and delivered to Dr. Parsons, you cannot say that you have any knowledge in regard to it?

A. No, I cannot say that.

Q. When did you take your observations of the stations with reference to taking the samples of the water?

A. Practically the same time. The boat usually was anchored. I think almost always. It was anchored at a point and the samples would be taken and the observations made at that location.

Q. Did you make the sextant readings yourself?

A. Almost always.

Q. Who else was there?

A. I believe Dr. Parsons afterwards made a few. During the progress of the work he made a few of the sextant readings. I am not sure but what Dr. Miller made a few. I am not sure that any of them were recorded. I am not sure that any of them were made and recorded, I am not sure about that.

Q. Well the actual taking up of the samples and the dropping of the cage and the pulling up again that was done by a boat
1140 hand?

A. Most always by a boat hand. Sometimes I did it myself and sometimes Dr. Miller did it. But it was usually done by the boat hand.

Q. Now who made the determinations of the depths at which the samples were taken?

A. I did that or Dr. Parsons or Dr. Miller one of us three would do that. I will explain that more thoroughly. The sample when

it was taken would be taken at a certain depth, while the bottle was filling—there were knots in the rope every five feet, I think. The distance from the knot down to the water would be taken, and that deducted from the reading. For instance if there was a knot at the twenty foot mark and the knot was 2 feet down from the boat, the depth of the water was 18 feet. That was the usual way of arriving at the depth.

Q. The cage was heavy enough to prevent the current or tide from having any effect?

A. Any effect. It possibly would float out from the boat, as near as one could tell, it might be three feet. You could not get it absolutely vertical; it would be practically vertical. The distance would not be affected by it.

Q. Your depths are to some extent approximations, are they not?

A. I suppose they are, within a foot, except possibly the surface sample, that was where you could see.

Q. Are the station locations approximations also?

A. Anything is an approximation.

Q. That being so, within what distance are your station locations approximated?

A. I should judge the sextent readings would give probably less than one hundred feet, probably less than fifty feet, if it were close by.

Q. Were the objects upon which you made your readings, data for the readings—did you take any particular part in that?

A. We usually took the center of any object we examined.

1141 For instance a church spire at a distance of *a distance of* a couple of miles or so of course looks like a single point.

Q. What about Fort William?

A. Fort William was taken at the center of the Fort.

Q. The center of the Fort?

A. Yes.

Q. Now, your approximations by the eye, within what number of feet could you say they were correct?

A. I think within probably ten feet.

Q. Those approximations were better than the sextant readings probably?

A. That is not so at all. Our distance *were* only one hundred or two hundred feet at most, and with the sextant readings the distances would be very long, the distance from the shore or any other place, would be very great. Of course we aimed to get as near a right angle as we could from the reading, and the sextant readings usually passed through two given points that we knew the location of.

Q. I understood you to say that the sextant locations you thought were within fifty feet?

A. Or one hundred feet.

Q. And the approximations by the eye you said are within 10 feet?

A. Yes, that is right.

Q. So the result is better in the case of the eye?

A. No, that is not so.

Q. Why not?

—. Because the distances in which you are dealing are entirely different. In the one case you are dealing with a distance from the center of the Bay, a very long distance. In the other case, you are right close to the shore. If you approximate within fifty feet of the distance to the shore it might be half of the total distance, where the point was close by.

Q. You were striving to make more or less accurate locations of stations?

A. Approximately accurate locations of the stations.

Q. Are the locations more or less accurate under the sextant method if they were within fifty feet?

A. I judge within fifty feet.

1142 Q. And the others by the eye were within 10 feet?

A. Yes, sir, where we had a close distance to observe from. Where it was close to the shore.

Q. What was the weight of the floats used in float observations?

A. I do not know exactly. I could not tell the weight of them.

Q. You did not weigh them?

A. We did not weigh them. We merely balanced them so they were just submerged or just above being submerged.

Q. In making these observations you have testified that your object was to cover one tide. Was your object to make your observations covering one tide?

Mr. O'Sullivan: I object as that is clearly in conflict with the ttimony of this witness. This witness has testified to observations relating to floats, and it related to the float observations and not to the water samples as implied in the question. It is clearly misleading and I object to it on that ground.

The Commissioner: Note the objection.

Mr. O'Sullivan: This witness has testified to three separate and distinct series of observations, one relating to water samples, one to mud samples, and the third to float observations, and it is respectfully submitted by counsel for complainants that the question ought to be rendered more definite as to which of these three observations is implied in the question.

Mr. Riker: The test whether counsel understands or not, is not necessarily a test of the intelligence of the witness.

1143 Mr. O'Sullivan: Complainants' Counsel respectfully submits that he is entitled to have questions put that are not only intelligible to the witness, but even to the counsel.

Mr. Riker: I do not think that follows at all.

Mr. Riker: Did you understand that question?

The Witness: Yes, I think I did.

Q. All right, won't you answer it?

A. You want me to answer it?

Q. Yes.

A. This is in regard to float observations?

Q. It succeeded an inquiry as to the floats. Now proceed?

A. These observations were taken during one flood of the tide.

Q. Have you before you charts that show the float observations?
A. Yes.
Q. Will you open, say the first one, that would be Exhibit No. 4, I think. There is an observation apparently indicated by a red line, and it has the notation February 25th, 1907. Will you take the chart and look at that indication of that observation and say whether it covers more than one tide?
A. Yes, that covered part of the flood tide.
Q. How much?
A. I cannot say. The time is not in there (indicating).
Q The indication of February 22, 1907, I think it is green, will you look at that Mr. Merritt, and say whether that covers more than one tide?
A. Yes, that the turn of the tide is indicated on this outer angle. It follows westward that way (indicating). It starts to come up here (indicating) when we took it up.
Q. 2:30, that indicates the change of the tide?
A. Possibly. There is a long space there. It went directly west, then at 5:30, the float started up there (indicating).
1144 Q. Nearly three hours?
A. Yes.
Q. And it was taken out as a matter of fact when it began to get dark?
A. No, it was going up the Bay at that time. You see the curve there, going up the Bay (indicating).
Q. That observation is indicated as in February, is it not?
A. Yes.
Q. Was it not your practice to take the floats out when it got dark?
A. We would go as long as we could see at all. That is, unless the tide changed. If the tide changed before it got absolutely dark, we would take them out of course.
Q. Now, in making the graphic exhibitions of your observations, what part did you take personally in that work?
A. I set down all the notes of it.
Q. You set the notes down?
A. Yes. I usually did the sextant work, except possibly what the other boys did. I cannot remember everything except as it is in the note book. If you let me refresh my memory by the note book in my own handwriting, I can tell you whether I took the observations or they did.
Q. Direct your attention to Exhibit No. 18 for complainants Sheet No. 1. Now this is a graphic exhibition of your work, is it not?
A. Yes.
Q. And what part of that particular part of your graphic work is your own?
A. All of these were done in my office. The Government made the original map from which these were taken. Theirs is a large map. On that original map there are certain indications for latitude and longitude; lines were drawn on the Government map of the large divisions of longitude and latitude. Those were taken and cut up. They were lab-led across Latitude and Longitude. They were

cut up into smaller maps, and each one was traced by itself. Then the large divisions were again subdivided into smaller divisions of latitude and longitude. Those divisions were made by myself, in nearly all cases, I think. Possibly Mr. Losee may have
1145 made some on the smaller maps, but Mr. Losee himself traced on the tracing cloth the outline from the government maps, the outline of the shore line. On these government maps he traced the large sections of latitude and longitude and made the smaller sections directly on the tracings. We set it on to the tracings so the tracings became the original map for the smaller divisions.

Q. Where are those original sections of the Government map?

A. Those were destroyed; cut up and thrown away.

Q. There are a great many small figures?

A. Yes.

Q. On the Sheet No. 1?

A. Yes.

Q. Do they represent original observations?

A. Those are entered from the Government work. That is all government work. There are not nearly as many figures as are shown on the Government map. It was only to get the idea of the depth at different stations.

Q. Who put those into the original tracings?

A. Mr. Losee did that.

Q. And he made the tracings?

A. He made the outline tracings, as I told you before. He made the outline of the shore lines, and put in those little figures and the latitude and longitude was plotted usually by myself.

Q. On the original map or on this?

A. On this, and on the original map there were figures on the side of the map by which you would be able to draw in the lines clear across. These were drawn in clear across by myself. Then these were cut up and made into smaller maps. I am not sure that in all cases I drew in all the lines subdividing the latitude and longitude. Most of them I did. Mr. Losee may have done part of that.

Q. Now, in Sheet 1, your work in addition to putting in these lines was the location of these stations?

A. Yes.

Q. Will you tell me just how you did that?

A. These are divided into certain squares. These were
1146 taken by sextant readings. If we had a point there (indicating) and another point there (indicating) and another point here (indicating) we could locate ourselves on the map by that point. I am not sure whether the original plan of locating by the square in which we were in was carried out. The whole idea of this was so that we could locate the place in a certain square. That square would be designated by a number.

Q. Are the land marks shown on the map?

A. I do not know whether they are or not. I am not sure about that. For instance, we would take the lighthouses,—Fort Wadsworth, and the opposite fort and Sandy Hook Light. I am not sure whether they are plotted on this or not.

Q. This you have testified is to your knowledge a correct copy of the original tracing?

A. This is a correct copy of the original tracing, yes.

Q. And therefore the original tracing does not contain the landmarks?

A. The original tracing was precisely like this.

Q. And there was nothing on the original tracing in your judgment, that is not on this?

A. That is it exactly. One must be an exact copy of the other.

Q. So that if the landmarks do not appear on these blue prints, they were not on the originals?

A. Exactly. This must be an actual copy of the other.

Q. As to the method of locating your stations, is it or is it not by the squares as shown or is it by sextant readings?

A. I am not sure whether they were located by that or not. We located these by sextant readings (indicating). We had sextant readings and located them on the map, and the squares were gotten merely to tell where the stations were so they could be easily found.

Q. This work was done on the tracing, as I understand, of which these are blue prints?

A. Exactly. This work was done on the tracing.

1147 Q. And unless your tracing, the original, had landmarks indicated on it, how did you locate these points?

A. There was no way to do that.

Q. Except to approximate it by squares?

A. By the squares, that is it.

Q. Can you say from examining this Sheet 1, of this exhibit, whether there are shown there the landmarks or data for your sextant readings?

(Witness examines map).

A. There is a lighthouse there.

Mr. O'Sullivan: Indicate the square.

The Witness: This is not a good map to take. All of the samples are located on another sheet. There is Fort Wadsworth (indicating). There is Swinbourne Island (indicating), that is one of the stations and the Hoffman Island is one of the stations and the West Bank Light was one of the stations. I have forgotten the names of all the stations, but there was a large number that was on the original chart and they were located. I think all those stations you will find here.

Q. How could you locate a station within a square unless you determined the general location of that square by your landmarks or data of your observation?

A. You would have to do that, yes.

Q. Having that in mind, does it determine in your memory, the exact way in which you could locate these stations?

A. I remember they were plotted from a very large protractor and the angles were taken off by the protractor. In cutting this up, some of the locations may have been made on a Government map, prior to placing them on this map. I think we did have a large

section than these made. I think there was one map covering the whole bay on which the angles were taken from both sides of
1148 the Bay. These are smaller maps for convenience, and my impression is I did have a large map showing all the stations around the Upper Bay and the same appeared for the Lower Bay, showing all the stations, and from these the different angles,—you get sites on both, you would have them on both sides of the Bay.

Mr. O'Sullivan: I offer such a map as the witness has just indicated, Mr. Riker. It is already marked as Complainants' Exhibit No. 16. It will show you what the witness is endeavoring to impart.

Q. Mr. Merritt, what precautions were taken with the samples of water after you obtained them to prevent adulteration?

A. As they came up, they were collected in glass stoppered bottles. After being brought to the surface, they were immediately stoppered and put in a basket. I forget whether we tied a cloth over the stoppers or not. Then they were taken directly into the laboratory by Mr. Parsons or myself or Mr. Miller and they were examined. As to the exact time at which they were examined chemically I do not know. I do not know how long after. Mr. Miller can tell you that. Whether any one got in and adulterated them, I cannot say about that.

In regard to the bacterial samples, these samples I usually brought them and gave them to Dr. Parsons who plated them on the boat. They were plated directly so that no one could have changed the count of them. He could tell right away, very quickly whether anybody had been bothering with his samples in the laboratory.

Q. The samples that you took during the day time were turned in at the end of the day?

A. We used to come in usually at night time. The bacteriological samples were plated directly on the boat. The chemical samples were brought in at the end of the day and as a usual thing they lay overnight. I do not think they were examined the same day.

1149 Q. They were turned in all together those chemical samples?

A. Yes, brought in all together.

Q. These charts show the float observations?

A. Yes.

Q. Were they prepared by you?

A. They were prepared in the same general way as the others were. They were government charts originally and they were copied by me on to this.

Q. That is, the foundation chart?

A. Yes, I plotted on one of the charts the exact course of the float from my observations in the book and then Losee made several copies from them, directly from the chart in my presence. He made these charts and I looked over these charts.

Q. You took, in the first instance, as a foundation, the Government map or chart of the Harbor?

A. Yes.

Q. And on that Mr. Losee made the tracing?

A. I made the chart, yes, and then Mr. Losee made the tracing of that. No, I did not make any chart on that, that is right.

Q. The tracing was taken in the first instance from the government map?

A. And this was made, that is right.

Q. And after the tracing was made, what was then put on the tracing?

A. I think the tracings were printed direct. The white points that you see there were made on the tracing before anything was put on it. They were the ground work.

Q. So that the tracing was merely a means of transcribing the government map on to this?

A. That is it.

Q. And if you know, do the tracings contain all that was on the government map?

A. Not necessarily. They contain the outline. They do not contain all the street lines. They merely contain the outline of the Government map, that is the shore line. That is all you are concerned with.

Q. Now, taking the one which is marked with the figure 1 in a circle on the left hand upper corner, did you place those lines in green red and yellow on that chart?

A. I do not think I placed those on that individual chart. I placed those on one of the charts, and Mr. Losee copied the
1150 others from that one, and I think this is one of the copies. I think there were four or five of these made at that time.

Q. You made an original from which you understand Mr. Losee, your assistant, made several copies?

A. Yes. He made them with me in the office, and he did the actual work while I looked on, — see how he was doing it.

Q. In taking the float observations, what special observations did you make?

A. The only observations that we took in making the float observations, were roughly, the direction of the wind and the location of the float at a given time, so that we could plot the location of the float at a given time from our notes.

Q. Did you take the velocity of the wind?

A. No, only as I said before, we relied on the captain of the boat to take the velocity of the wind.

Q. And you made a notation of the guess he made at the different points at which you took the locations?

A. Yes.

Q. In order to determine the path of the floats, after you put them in the water, how often did you make observations of locations?

A. I do not remember. That will show on those maps.

Q. How did you take your observations of locations?

A. On some of the float observations they were taken by estimation on some of the first float observations. The first two or three

I think were all taken in that way. Later they were all taken by sextant readings.

Q. There are twenty-seven in all as I understand it, graphically represented?

A. Yes.

Q. What proportion of those did you take by the sextant?

A. I cannot tell you off hand. I cannot remember.

Q. You are sure that these 27 that are so represented on these charts that are produced here, are the ones that you made personally?

A. I yes, sir, I made them all personally I made the
1151 notes of them. All of the notes are in my handwriting, and I made all those, yes, sir.

Q. You made all the memoranda at the time when the observations were taken?

A. That is the only thing I can go by. I cannot remember the actual work.

Q. You could not be expected to. You have compared the originals with these charts?

A. I did, yes, sir.

Q. When?

A. I did that before these charts were made. Before they were handed in. When we made those charts, we compared all the work at that time.

Q. The delineation was made by a reference to your original notes between yourself and Mr. Losee?

A. Yes.

Q. And when they were finished and handed in, that ended your connection with it?

A. That is all.

Q. And you have not compared these particular exhibits with your note books?

A. No, not since that time. These are the ones that Mr. Losee made. I have examined them far enough to remember they were the original ones that Mr. Losee made.

Q. You say now that these are the originals?

A. They were the ones that he made with me.

Q. Those you examined, those you compared, not these that are marked in this case, which are here before you, are they the originals?

A. They were the ones made in the office, that I know, from his work.

Q. Did you take part in the making of the copies?

A. Yes as I told you before, I stood over him while he was doing it.

Q. And you compared those with the original?

A. I have the book, or he may have had the book at the time. We did the work together, only he actually did the drawing.

Q. I am not speaking of the making of the original chart?

A. No, these four or five sets.

Q. Were they also made by a reference to your original memoranda or the original chart that was made?

1152 A. There was the one that I made direct, first off. That was a rough sketch, and these were taken from that.

Q. Not from the original memoranda?

A. Not from the original memoranda; that was thrown away.

Q. By memoranda, perhaps I should distinguish between your original sketch and the memoranda made at the time in your note books?

A. The sketch was thrown away. We checked these over with the original memoranda.

Q. All these copies?

A. All these copies, to see that they were all right and to see that they checked among themselves. Of course, in making copies like that, possibly they might have varied a very small bit but not of any account.

Q. So as a matter of fact each one of these is an original?

A. Each one is a separate distinct original as a matter of fact, and there may be very slight variations in them, but they were as near as we could plot them together.

Mr. Riker: I think that is all.

Redirect examination by Mr. O'Sullivan:

Q. Mr. Merritt, you were asked some questions on the velocity of the wind. Were you at that time and are you now aware that there is a meteorological observatory for determining those facts accurately?

A. We expected at the time that the meteorological work would be taken and not our work. Ours was merely a check.

Q. I show you complainants' Exhibit No. 13, and ask if the repart of the New York Meteorological Observatory for the department is such data as you relied upon for questions of velocity of wind?

A. Yes, those are the reports, the Department of Parks.

Q. Mr. Riker asked you some questions on approximations by the sextant and by the eye. Is it a fact that in making determinations by the sextant, you were dealing with questions of miles?

A. Yes.

Q. Is that a fact?

A. That is the fact.

1153 Q. And in making determinations by the eye, you were dealing with questions of feet?

A. That is it exactly.

Q. Mr. Riker asked you some questions about the Government maps. What do you mean when you use the term "Government maps"?

A. The Coast survey.

Q I hand you Complainants' Exhibit No. 16, and ask you if that is one of the maps that you mean when you say Government Maps?

A. Yes, Coast Chart No. 120, that is one. That may not be the

kind we used exactly, but that is the same kind. Every year or two they are revised and brought up to date. That may be a later date than the one we used. But that is the class we used. You can see on the sides of that the latitude and longitude.

Mr. O'Sullivan: I think that is all.

Recross-examination by Mr. Riker:

Q. Mr. Merritt, are you a surveyor; have you been a surveyor by profession?

A. Yes. We get that in the engineering course.

Q. And with accurate reading of the sextant, provided your data are accurately located, have you any difficulty in locating the point of observation, accurately?

A. It depends on what you mean by accurately.

Q. Well, within five feet?

A. I think you would be troubled to locate, by a sextant, within a distance of 5 feet.

Q. How far away were your landmarks and data?

A. I do not remember. They were a good big distance, probably anywhere from 1 to 5 miles.

Q. Given a distance across the water of a mile, and fixed data upon which to take your observation, would you have any difficulty in locating?

A. You certainly would.

Q. Why?

A. I do not know why, but I know that on land you could take a transit and go around a circle and you cannot get back for three hundred and sixty-five degrees. It is merely an approximation.

1154 All those things are. Your boat will shift that distance. The difference in the tide, even though your boat were anchored, would cause that.

Q. Of course if your point of observation is not a set point your result will be thrown out by that?

A. Even though you were absolutely fixed on the land you cannot take these observations as if you were close by. There are a number of shifts in that thing that would have to be taken into consideration. In some observations you would be lucky if you got within 50 feet.

Q. You think you have not probably come within closer to the location than 50 feet?

A. In these samples that were taken with the sextant, out in the bay, I doubt whether we were any closer than 50 feet.

Redirect examination by Mr. O'Sullivan:

Q. Those are the recognized modes of locating areas?

A. There would be only one other method, that we could locate ourselves more accurately by. That would be by two transits, and that would take altogether too long.

Q. There was no practical reason why you should get any nearer than a fair approximation?
A. That is the idea exactly.

JAMES R. LOSEE, a witness called on behalf of the Complainants, being first duly sworn, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. What is your full name?
A. James R. Losee.
Q. And what is your vocation?
A. Draftsman and surveyor
Q. Where do you reside?
A. Tarrytown.
Q. What is your present employment?
A. I am chief assistant for Mr. Merritt.
Q. And Mr. Merritt is what?
A Engineer and chemist, Engineer and Superintendent of the Water Works at Tarrytown.
Q. And you are his chief assistant?
A. Yes, sir.
Q. Did you do work in connection with Mr. Merritt and
1155 under his direction during the year 1907?
A. I did.
Q. Did you assist Mr. Merritt in preparing maps and charts during that year as draftsman?
A. I did.
Q. I show you Complainants' Exhibit No. 4, Complainants' Exhibit No. 5, Complainants' Exhibit No. 6, Complainants' Exhibit No. 7, Complainants' Exhibit No. 8, Complainants' Exhibit No. 9, Complainants' Exhibit No. 10, Complainants' Exhibit No. 11, and ask who prepared the float courses and the data on these exhibits, other than the printed matter?
A. Mr. Merritt and myself.
Q. Who did the actual drawing of the courses of these floats?
A. I did.
Q. On these various exhibits that you are now looking at?
A. Yes, sir.
Q. And who wrote the dates of the observations under the words, which are printed, did you?
A. I did.
Q. Are those in your handwriting?
A. Yes, sir.
Q. In the various colored inks?
A. Yes, sir.
Q. You have examined these charts before, yesterday?
A. Yes, sir.
Q. Under whose directions did you make drawings of the courses of these floats, taken by the floats, and record the dates of the observations, which are as you stated in your own handwriting?

A. Mr. Merritt.
Q. Where were you at that time?
A. In his office at Tarrytown.
Q. Who supplied the figures, the courses of these floats, as indicated by you on this map?
A. I put the actual figures there. Mr. Merritt got the figures from the original note books.
Q. And supplied them to you?
A. Yes.
Q. Did you ever complete these maps and do the course tracing and recording; did you submit them afterwards and compare them with Mr. Merritt with the original data?
A. Yes, sir.
1156 Q. And did you find your transcript to be correct?
A. Yes, sir.
Q. In each one of these exhibits?
A. In each and every case, yes.
Q. Mr. Losee, I show you Complainants' Exhibit No. 18, Sheets 1 to 16, and ask you what you did in regard to those sixteen charts that are marked Complainants' Exhibit No. 18?
A. I think I did practically everything but locating the serial numbers, where the samples were taken.
Q. State what you mean by the serial numbers?
A. Those with the circles around them.
Q. The figures?
A. The figures with the circles around them.
Q. Numbers enclosed in a circle?
A. Yes, sir, and with the exception of these latitude and longitude lines.
Q. And who did those?
A. Mr. Merritt, that is on the original. I may have drawn in here on the tracing. On the original Mr. Merritt put it on.
Q. Mr. Losee, I call our attention to several small numerals that dot these charts and ask in whose handwriting those small numerals are?
A. Mine.
Q. You yourself made those?
A. Yes, sir.
Q. At whose direction?
A. Mr. Merritt's. This is a tracing of the government map. It is not from my own data at all.

Cross-examination by Mr. Riker:

Q. How old are you?
A. 23.
Q. Before 1907, what had you been doing?
A. At school.
Q. Where?
A. Washington Irving High School, Tarrytown.
Q. When did you go into Mr. Merritt's employ?

A. In June, 1907.

Q. Direct your attention to Complainants' Exhibits Nos. 4 to 11 inclusive. What part of those exhibits represent work actually done by you?

A. This is the print of the tracings made of the Government map and this work in colored ink was done by me.

1157 Q. It is a print of a tracing?

A. All, with the exception of these colored lines.

Q. Now, what kind of a print do you mean when you say it is a print?

A. I do not know whether to call this a white print.

Q. Is it a lithographed print?

A. I do not know what you would call it, the same as a blue print, only on white paper with blue lines.

Q. A chemical process as you understand it?

A. A chemical process, yes, sir.

Q. Did you make the tracings from the original Government map?

A. Yes, sir.

Q. Did you put on this map everything that was on the original?

A. No, sir.

Q. Well, under whose directions did you omit anything?

A. Mr. Merritt's.

Q. Did he tell you what to omit?

A. He told me what to put on. He told me to put the outline on, the outline of the shore.

Q. Were the tracings made in sections or in one piece?

A. Just one tracing.

Q. One tracing of the whole map?

A. Yes.

Q. Taking out such parts as Mr. Merritt told you and putting them on to the tracing?

A. Yes, sir.

Q. And what was done with that tracing?

A. A print was made of it.

Q. As a whole?

A. Yes.

Q. Are these the prints that you referred to?

A. Yes, sir.

Q. Then what was done with the prints?

A. We located these floats on the prints, the direction of the floats.

Q. On one print?

A. No, on a number of them, a number of sets.

Q. When did you cut the original map up into sections, as it appears to be?

A. These are a number of prints of the original tracing that we located these on, each print.

1158 Q. On each separate print?

A. Yes.

Q. And then you cut them up into sections?

A. The size of the tracing is the size you see this. A print was made of that tracing.

Q. Was not the original tracing a general map of the harbor?

A. Yes, just as you see it here.

Q. When you cut it up—you did cut it up, did you not?

A. No.

Q. After the prints were made, you with Mr. Merritt, marked these different stations by which you delineated the path of the floats, did you not?

A. Yes, sir.

Q. You did the actual work of marking out the stations, and connecting them up?

A. Mr. Merritt did the reading from the note book and located it, and I did the actual drawing in of the lines and the figures and so forth.

Q. Will you tell me with reference to the green that is delineated on Exhibit No. 4, how did you get the starting point for that line?

A. Mr. Merritt's not book.

Q. He gave you what from his note book?

A. I could not tell you just what.

Q. In a general way, what did he give you?

A. The angles taken by his sextant, and the distances from certain places and so forth.

Q. He gave you the readings?

A. Yes.

Q. Now, how did you locate the plot?

A. He did the actual plotting of the thing himself, and I just connected the points.

Q. All you did in this matter was simply to take a green ink and connect it up?

A. The points that he had plotted from his original note books.

Q. Did you attempt to verify the corrections of his notations from his original note books?

A. In a way. He actually went over it himself, most of that checking work—this drawing in and like that, he checked
1159 my work as I did it. He was directly over me seeing that I connected the right points. In that way we kept that check on it.

Q. Will you look at that green line on Exhibit No. 4, and say whether you can give approximately the average distance of the point; take either end, I do not care which way you go?

A. I do not know what the scale of this map is. It is impossible for me to tell that way. About a mile to an inch I should think.

Q. In between the stations that were located by him from his memorandum books, *dow* did you determine the curves that are indicated?

A. He determined those himself, between any two points.

Q. What did he do; how did he do that?

A. If he had two points, he knew about where it went and I just connected the two points wherever he said, from what data he had.

Q. And he did that?
A. Certainly he and I both worked on it. I did the actual drawing and he gave the locating in.
Q. What location?
A. The points of observation at the different times where the floats were.
Q. In connecting up all the points, taking the green line, the part of it which is indicated as being in the Lower Bay, there is a space of that line between the figures 12:30 and 5.45.
A. Yes, sir.
Q. You see that?
A. Yes.

(Witness examines chart).

Q. That indicates a succession of more or less well defined curves?
A. Yes, sir.
Q. How were they put on the map, those curves, who did it?
A. I did on this map here. Mr. Merritt took one set and without my assistance at all, and completed a set, and these were all plotted with his assistance in checking.
1160 Q. Then the original set from which you made the copies was in fact all done, so far as indicating the courses or routes is concerned by Mr. Merritt himself?
A. Mr. Merritt himself, yes, sir.
Q. Did you have anything to do with that original set?
A. Yes, sir. Nothing at all with the plotting of it.

Mr. Riker: That is all.

At 1 P. M. adjourned for noon recess to 2 P. M.

1161 Corporation Counsel's Office, Hall of Records.

NEW YORK CITY, November 29th, 1911.

Afternoon Session—2 p. m.

P. SCHUYLER MILLER a witness called on behalf of Complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. You have already testified as to the work which you did for the New York Bay Pollution Commission?
A. I have.
Q. Were you retained in the service of the Metropolitan Sewerage Commission?
A. I was.
Q. In what capacity?
A. In the capacity of chemist.
Q. Under whose direct supervision or direction were you working?

A. I was working under the immediate and direct supervision of Mr. David S. Meritt.

Q. Who testified on the stand today?

A. Yes.

Q. What special feature of the work was assigned to you, Mr. Miller?

A. All features of the work which might pertain particularly to chemical—whatever chemical examinations might be required or such assistance as might be needed by the engineer.

Q. By the engineer you mean?

A. Mr. Merritt.

Q. Where was the laboratory located in which you worked?

A. The laboratory was located upon the second floor of the Aquarium Building, Battery Park, adjacent to the office of the Superintendent of that Building.

Q. And was it there that you did the work of a chemical nature recorded for the Metropolitan Sewerage Commission?

A. The work was substantially done there, with few exceptions.

Q. And where were the exceptions done?

A. The exceptional cases were when the work was done at
1162 Mount Prospect Laboratory by courtesy of the Water Department.

Q. Did some of the work there?

A. I did a small amount of the work there.

Q. I hand you Complainants' Exhibit No. 12, Mr. Miller, and direct your attention to the 23 sheets of tabulation work in that exhibit and ask what part of that work you did which is recorded in in that exhibit.

Mr. Riker: I think that he has testified to that already.

The Witness: I think I have.

Mr. Riker: He started on the details as I remember it.

The Witness: I am willing to let my testimony remain.

Q. Now, Mr. Miler, have you compared the work that is therein recorded of a chemical nature with your original note books?

A. I have.

Q. Just state the headings under which your work is recorded?

A. My work is recorded under headings of Turbidity, Color and Chlorine. Those are the columns which contain the professional data filed by me, obtained by me. In addition to that I may state that certain samples as designated by serial numbers in the third column were taken by me personally. I think my previous testimony would cover that point.

Q. Have you compared each one of those 23 sheets of tables with your original note books made at the time the determinations were recorded in all these tabulations?

A. I have.

Mr. Riker: I object to the question before he answers it, on the ground that it does not appear that this is a memorandum made by the witness, or that he has had any part in the making of this

particular thing, with reference to this particular exhibit, it is submitted is irrelevant, immaterial and not the best evidence.

1163 The Commissioner: Note the objection.

Q. How do you find the tables on comparison with your original note books?

Mr. Riker: The same objection.

The Commissioner: Note the objection.

A. I find the tables throughout the exhibit substantially correct, with the exception of certain pages—four pages, I believe—on which I note an error in alignment, but not in actual figures.

Q. Beginning at what page?

A. Beginning at page 19, and the succeeding pages to and including page 23,

Q. And that error consists in what?

A. That error consists—do you wish me to cite?

Q. No, what is the error?

A. The error appears to be in alignment of the draftsman. The essential figures are correct as compared by me with my original notes. The alignment seems to be somewhat confusing.

Q. Have you now in your possession four blue prints of the same tabulation, with the corrected alignment?

A. I have.

Mr. O'Sullivan: I offer those as a substitute for pages 19, 20 and 21 and 23, where the alignment is corrected. The alignment is corrected in these and I offer them as substitutes for like pages in the exhibit where the alignment was incorrect.

Mr. Riker: I would like to ask a question or two on the offer.

Cross-examination by Mr. Riker:

Q. Who prepared these blue prints?

A. I have no knowledge.

Q. Where did you get them?

A. They are part of the official exhibit. You mean these blue prints?

Q. No, the ones that are being offered.

1164 A. These were furnished by Mr. A. J. Provost, the actual blue prints were.

Q. Who made the originals from which the blue prints were taken, if you know?

A. I do not know.

Q. Are they copies of any original tables or tabulation made by you?

A. They are.

Q. Where is the original?

A. In my notes.

Q. They are taken from the original memoranda in your notes and of what do your notes consist?

A. Of the serial numbers and the data testified to. The same notes that I testified from previously in connection with this exhibit.

Q. In what form are they, note books?

A. In note book form.

Q. And if you know what is the material that is included in these four sheets that are now offered taken from your note books?

A. The material from my personal note book was transcribed by me personally in manuscript form and transmitted to Mr. A. J. Provost, who was at that time Secretary of the Metropolitan Sewerage Commission.

Q. Then, when was that transcript furnished to Mr. Provost?

A. Those transcriptions from my note book were furnished, whenever I had material to offer. Frequently every day, sometimes every other day.

Q. I am confining this examination to these four exhibits, those four sheets. They are to be put in as an exhibit, part of an exhibit.

Mr. O'Sullivan: I am going to ask leave to substitute them for the others, where the alignment was incorrect.

Q. I am speaking of those four sheets now being offered; when was the transcript of your memoranda book furnished to Mr. Provost for those?

A. For the correct sheets?

Q. Yes, Those sheets that you have before you?

1165 A. Since the adjournment last night.

Mr. Riker: I object to the offer on the ground they appear to be copies of transcripts from original data and the original transcript, the original data not having been offered, or accounted for.

Mr. O'Sullivan: Complainants' Counsel now offers to defendants' counsel the series of reports made by the witness on the stand, with the dates appended thereto made from May 1st. 1907 throughout the month of May, and April, and with which this witness has compared the data that is offered where the alignment of his figures or numerals have been corrected. I now offer that to counsel for the defendants.

The Commissioner: Note the objection of the counsel for defendants.

Redirect examination by Mr. O'Sullivan:

Q. Have you compared all the figures and numerals under the various column heads that include your work with your original reports after recess last afternoon?

A. Since recess last afternoon I have compared all the figures in all the columns relating to my work in this exhibit, not only with my own original notes, but with the copies, the autograph copies submitted to the Secretary of the commission, and in your custody, and have found them correct, or, have corrected them, and on the sheet which I have here. I checked on the original first presented from me, and the note book, first, and yesterday after adjournment, I checked from that note book and from the original manuscript.

Q. Did anyone assist you?
A. I was assisted by Mr. Provost.
Q. Now, What did you do this morning?
A. This morning I took this blue print.
Q. Indicate which, the substituted sheets?
A. The substituted sheets, being numbered 19, 20, 21 and
1166 23, and compared those.
Q. With what?
A. With my original notes and reports.
Q. And you found them how?
A. Found them correct as they are now printed.

PAYN B. PARSONS, a witness called on behalf of Complainants, being recalled, for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Have you compared the four sheets, on pages 19, 20, 21 and 23, with the sheets they are to be substituted for and with your original nothes and reports.
—. I have compared the substituted sheets with the original reports, and I previously testified that I compared the original reports with the exhibit and found them to agree.

Mr. O'Sullivan: I now offer those four pages, 19, 20, 21 and 23, and ask Mr. Commissioner that they be substituted for the corresponding pages in the exhibit, as the alignment has been corrected in the figures complained of, and that more truly represent the actual facts.

Mr. Riker: I object to the offer on the grounds as already stated, and I object to the substitution of any part of an exhibit already marked on the ground that no exhibit can be so mutilated and retain any of its validity, if it ever had any.

The Commissioner: The sheets will be received subject to the objection of counsel for defendant and marked as a separate exhibit.

Mr. O'Sullivan: Shall I remove pages 19, 20, 21 and 23
1167 and substitute these?

The Commissioner: I do not know as I can do anything with that exhibit.

Mr. O'Sullivan: I will offer these as an exhibit in continuing the series

The Commissioner: Very well, I will so mark them.

Mr. Riker: The same objection to the offer.

The Commissioner: The objection will be noted. Complainants' Exhibit No. 19 is offered as a substitute for Sheets 19, 20, 21 and 23 of Exhibit No. 12. That will identify just what it is.

Marked Complainants' Exhibit No. 19, offered as a substitute for Sheets 19, 20, 21 and 23 of Exhibit No. 12.

P. SCHUYLER MILLER, a witness called on behalf of Complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Mr. Miller, I hand you Complainants' Exhibit No. 14, consisting of 17 sheets of tabulated matter and ask what part of the work tabulated under column heads was done by you?

Mr. Riker: Before he uses that, I would like to ask some questions on it.

Cross-examination by Mr. Riker:

Q. Did you have any part in making the originals from which those blue prints were taken?

A. You mean the original tracings?

Q. Tabulation?

A. Yes. In the tabulation, I had no part.

1168 Mr. Riker: I object to his using the exhibit of tabulations on the ground that he has no knowledge of the paper that is produced, and had no part in making it.

The Commissioner: Note the objection.

Redirect examination by Mr. O'Sullivan:

Q. Defendants' counsel has said that you have had no knowledge of the preparation of the work tabulated in the exhibit under discussion, Complainants' Exhibit No. 14?

A. In Complainants' Exhibit No. 14, I can testify that all of the work from sample No. 12, as noted in the second column, to and including 705 were examined by me in so far as they may pertain to the data recorded under the categories of color and odor and loss on ignition, and the greater part of the remarks as noted in the last column describing the physical characteristics of the sample under examination.

Q. And all that you have just described whose work is?

A. As I stated under those numbers, and under those captions, the work was mine entirely, that is, the work as reported and as tabulated, and in addition, I may say, that some of these samples were collected personally by me.

Q. The work that appears in tabulated form in Complainants' Exhibit No. 14, to whom did you report the work done on these samples of mud?

A. This work was all reported to Mr. A. J. Provost, Secretary of the Metropolitan Sewerage Commission, just as rapidly as the results were turned out.

Q. Have you compared that work with your original notes and with your original reports as made to Mr. Provost?

A. I have compared this blue print exhibit. I have compared this exhibit since the adjournment last night, both with my own original notes and with the manuscript reports as submitted to Mr. Provost,

Secretary of the Commission, which reports were available yesterday for comparison, and I have found them correct.

1169 Q. Have you examined every item of work in Complainants' Exhibit No. 14 in the manner that you have just described?

A. I have examined every figure and every item of work in this exhibit since the adjournment yesterday.

Q. Done by you?

A. Done by me.

Q. And you found that how?

A. I found them correct.

Q. You found no errors of alignment, did you?

A. I found no errors of alignment or of notation. I found no errors whatever.

Mr. O'Sullivan: Your witness.

Recross-examination by Mr. Riker:

Q. Have you your original note book here?

A. May I ask which you are referring to, water or mud?

Q. Both or either.

A. I have the original note books in both cases.

Q. Will you get your original note books as to water. Have you the original reports which you made to Mr. Provost of your water samples?

A. Am I to answer the first question—before I went for the note books or the data, and after I returned with the note books?

Q. You have got the note books?

A. I have the note books, yes.

Q. Have you the original reports on the water samples furnished by you to Mr. Provost?

A. I have not.

Q. Do you know where they are?

A. Yes, I see them before me.

Mr. O'Sullivan: Being placed there by Complainants' counsel.

Q. Will you now take them up and answer whether you have taken them or not?

A. I appear to have them. I recognize a great many reports that I made to the Secretary, autograph reports signed in each case, each sheet signed.

1170 Q. Now, take the first item on your report to Mr. Provost, on the first report that you have in your hand?

A. All right.

Q. What sample is the first one appearing on that report?

A. The first sample appearing on this report, the first report, which I take in my hand, appears to be 500 feet off the Battery, serial number 291.

Q. That serial number is 291?

A. Under serial number 291.

Q. Now, you have, I think, testified that you examined a report as to certain features on a large number of these samples?

A. Yes.

Q. And did you give the serial numbers of the ones that you examined?

A. I did.

Q. What is it. What were the serial numbers that you examined?

A. There are a number of them.

Q. Well, which one did you examine, the serial numbers?

A. In serial numbers?

Q. Yes.

A. If it meets your point, I may say, that 291 is the serial number.

Q. No, that is not what I want to know. I want to know the limits of the numbers, the earliest and the last?

A. On water?

Q. Yes.

A. The earliest serial number on water was 291.

Q. When did you get that sample?

A. That sample I am reading now. Do you wish me to read from the original report submitted to Mr. Provost?

Q. If that will refresh your memory?

A. Or do you wish me to read from the exhibit?

Q. Any way that will refresh your memory from memoranda that you have made yourself, if you can refresh your memory. If you cannot refresh your memory and cannot remember, of course you would not testify as to that.

A. In a general way, it was taken some years ago. In a general way I remember where I got it, and I have here my written
1171 report in the custody of the court. I also have my note book, my personal note book on the matter. There are other note books, that is field books containing data, as to when I took that sample.

Q. Well?

A. And, there is the exhibit.

Q. Can you state when you took the sample from anything that is in your possession, either from your memory or from memoranda which you have properly used to refresh your memory?

A. Sample No. 291 was taken on the 23rd of April.

Q. What year?

A. 1907.

Q. Did you take it personally?

A. I took that sample personally.

Q. Where did you take it?

A. Took it approximately 500 feet off the Battery.

Q. At what depth did you take it?

A. I took that sample at the surface.

Q. In what way did you take it, by what device?

A. By the device, a sample bottle, attached to a rope and weighted to sink it to the proper depth. An appropriate device to jerk the

cork out and allow it to fill with water at the time we wanted the sample to be taken.

Q. Did you do any preliminary work on the cage or bottle in which the sample was taken to assure sterility?

A. I did.

Q. What did you do?

A. Cleaned the bottle out thoroughly with tap water.

Q. Where did you get this bottle from?

A. The bottle was part of the laboratory outfit.

Q. What laboratory?

A. The laboratory with which I was connected.

Q. Which one was that?

A. That of the Metropolitan Sewerage Commission.

Q. You cleaned it out with tap water in the laboratory?

1172 A. In the laboratory.

Q. Then what was done with it?

A. Then it was placed with the apparatus and carried to the boat. The boat being moored adjacent to the laboratory.

Q. Then what did you do?

A. Took it out and proceeded to use it when I got to the point where I wanted to.

Q. How did you determine the distance at which you used it?

A. By the eye.

Q. Are you accustomed to determining distances by the eye on water?

A. I am, and on land as well.

Q. And the point was distant how far from your land mark?

A. Approximately 500 feet off Battery Pier A.

Q. The end of Pier A?

A. The end of Pier A, that is where I started. That was my initial point.

Q. Did you put the bottle overboard?

A. Yes, sir, I did.

Q. And did you draw it up?

A. Yes, sir, I did.

Q. After you got it up, what did you do with it?

A. Transferred the contents to the sample bottles which had been previously prepared and numbered for that trip. Had them handy.

Q. How many samples did you divide the contents of the bottle into?

A. Only one.

Q. You put it into one sample bottle?

A. One sample bottle, what I brought up in this particular sample.

Q. What did you do with it after that?

A. With what?

Q. With the sample?

A. The sample was then dumped overboard.

Q. The whole of the sample was dumped overboard?

A. I mean the remaining part of the sample, not the sample which I took.

Q. Then what did you do with the sample that you took?

A. The sample I took was placed in my sampling bag
1173 which I carried.

Q. And then what was done with it?

A. With what?

Q. The bag?

A. The bag remained by me throughout the day.

Q. How was that sample labeled?

A. That sample was labeled by a serial number and by the station and other identifying data which would help me to identify it at the end of the day's trip.

Q. Have you got the label now?

A. No, I have not the label now. It has been destroyed long since.

Q. What other memoranda did you put on the label?

A. None except as stated in the evidence.

Q. What were those other identifying data, if any?

A. The other identifying data—usually in a case which has been selected, recording the depth of the sample, the temperature and any unusual conditions or circumstances that might occur. It was much easier to put those on the label at the time of the taking than to note them in the book and it was my practice to make up my set of sample bottles, label them with black labels before I started on a trip like this. Then I jotted down the notes there and in the books at the same time.

Q. And one would check against the other?

A. And one would check against the other.

Q. Did they contain as in this particular sample—can you say whether or not your memorandum book contains all that was on the label?

A. That would be an impossibility—the label is not in existence.

Q. Will you turn to your memorandum book, if you have it there, and tell me what memoranda you made at the time in the book?

A. This is only one of my memorandum books.

Q. As to No. 291?

A. For your information you wish this data as to which I have not testified before, memoranda made at the time of collecting sample No. 291?

1174 Q. Yes, go ahead?

A. In this other note book which was marked Book No. 2, Metropolitan Sewerage Commission, one of the field books, not a personal book.

Q. Did you not keep it?

A. I kept it showing my work, but it is not personal property.

Q. As to that sample you kept the memoranda?

A. As to that sample, I have marked the general condition of the weather.

Q. What was that?

A. Heavy fog, wind easterly, about five miles per hour. Starting on sample from the Battery to Communipaw Coal Company's Docks.

Q. Anything else about sample No. 291?

A. Sample No. 291 was taken at the surface. That is also indicated in this book as well as this book and on my original sheet.

Q. Which is your original entry?

A. The first entry—it is hard to—these two entries are practically simultaneous, the one being a book which was a record of the Metropolitan Sewerage Commission, and a field book, used indiscriminately by me and Dr. Parsons and Mr. Merritt, whenever we were called out, in which we entered our notes. This book was a book of my own in which at the same time I entered corresponding records as a check, and for a matter of personal convenience.

Q. They are both in your own handwriting for serial No. 291?

A. Absolutely. And this is a manuscript report transmitted to the Secretary after the completion of my examination of the samples taken, of Sample No. 291 and each succeeding samples as may have been grouped into that report.

Q. As to that No. 291, you took such parts of the original memoranda in those two books as you were directed—you did not put there what you were directed was unimportant to place in that transcript.

A. Yes.

Q. Now, in addition to that do you say you put on the label of the sample bottle, the same material?

A. Such portions of that same material as I thought were sufficient and reasonable and necessary to identify it when
1175 it reached the laboratory in company with the other samples which I took during the day.

Q. Can you say at this time just what part of the material in those two note books was placed on the label of that particular sample?

A. No, I cannot.

Q. Now you took that sample with the others collected during the trip at the end of the trip to the laboratory as I understand you?

A. I did.

Q. And what did you do to ensure that there would be no adulteration or contamination of sample No. 291 after it had been put into your sample bottle?

A. Simply trusted to the integrity of the officials guarding the Aquarium Building that my office would not be tampered with, or any of my personal effects.

Q. Was it sealed in any way?

A. Not in any way.

Q. No cork with a seal put on it?

A. No.

Q. How long after your taking of that sample did you make your analysis of it, you did analyze it, you analyzed that sample, did you?

A. I did, I testified to that on the direct.
Q. How long after you took it did you analyze it?
A. I cannot say.
Q. Not in a general way?
A. Probably the next day, maybe the day after.
Q. Anyway within a week?
A. The probabilities are it was within less than a week.
Q. Where did the bottle or the basket in which the sample bottle was held—where was the basket put in the Aquarium Building?
—. It was put in the laboratory.
Q. And under lock?
A. Not under lock.
Q. Was it shut up in any closet or receptacle?
A. The particular room in which it was deposited is not open to the public at any time, and the Aquarium Building, as a
1176 whole is closed to the public after certain hours.
Q. Did anyone except yourself have access to this particular room, if you know?
A. Not that I know of.
Q. Did you have a key to the door and did you lock the door yourself?
A. I did not lock the door.
Q. When you went out was the door locked, so far as you know?
A. It was not.
Q. Does the room open upon a general hallway or entry?
A. No general hallway.
Q. Does it open upon a hallway which is used by other parties besides yourself?
A. It is only open to a very restricted number of the Aquarium officials, it is not open to the general public.
Q. It was accessible then to the Aquarium officials?
A. To the Aquarium officials, but not to the general pubic.
Q. When you took your sample to analyze it, did you examine the label with care to see that it had not been changed?
A. That was my habit.
Q. What did you do in your habit of so examining the label as to make sure that there had not been a change in the label?
A. My handwriting is of such a character naturally that it is rarely called in question. The label was in my handwriting. The various notes in this book which I have referred to and also the personal book in my handwriting, and when I had returned from a sampling trip to the laboratory and was in a position and ready to examine the samples, I usually set them up in consecutive order on the table. I then examined the labels with these books open before me, making notes on the various pieces of apparatus which I might be called upon to use subsequently which would identify them.
Q. How many samples would you have before you speaking in a general way, if you can tell, for examination and analysis, at one time?

A. At one time?

1177 Q. Yes.

A. Why it was my habit to take them in groups of about ten. I usually took them in the decimals. I like to take them in fives and tens. I am addicted to the decimal system.

Q. Those examinations were about you think in tens?

A. Fives and tens. I prefer the decimal system always. It has been my habit for many years.

At 3 P. M. adjourned to meet in the Committee Room of the Finance Committee of the Board of Aldermen, December 27th 1911, at 10:30 A. M.

Adjourned to December 27, 1911, at 10:30 A. M.

1178 Supreme Court of the United States, October Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK CITY.
December 27th, 1911—10:30 a. m.

Present: James D. Maher, Esq., Commissioner.

Appearances:

Dr. William J. O'Sullivan, Special Counsel for the People of the State of New York.

Adrian Riker, Esq., of Counsel for the Passaic Valley Sewerage Commission.

Joseph Coult, Esq., of Counsel for the Passaic Valley Sewerage Commission.

Met pursuant to adjournment.

At Mr. Riker's request it was agreed to adjourn for noon recess at 12.30 until 2 P. M.

P. SCHUYLER MILLER a witness called on behalf of the complainants, recalled for further examination, testified as follows:

Cross-examination (continued) by Mr. Riker:

Q. Doctor, before the last adjournment, we were inquiring into the method of examining samples, as I remember it, and got as far with them as into the laboratory? Did you make the examinations of all these samples personally?

A. I think I made the examinations of all chemical samples, yes.

Q. Did you have any one assist you?

A. No, I had no assistant.

1179 Q. No assistant?

A. No assistant in the leboratory.

Q. I forgot whether you said you made the bacteriological examinations?

A. No, I had nothing to do with the bacteriological work.

Q. Who determined the stations from which the samples were taken?

A. When I was taking the samples personally, I usually determine the position myself, or, if I was accompanied by Mr. Merritt, he determined them, at those times I was usually checking on his determinations.

Q. You had fixed for you, or had you not fixed yourself, the place at which the samples were to be taken before you started on your expedition in the morning?

A. In a great many instances I did decide approximately where I would take the samples.

Q. What determined the location of the sampling stations if you can state?

A. You mean the making of the determination?

Q. Yes.

A. By an estimated distance, when we were near shore, by alignment with some piers or slips.

Q. Now, why did you select the stations which you did select; what was your purpose in selecting them as you did?

A. Well, to give you a general answer, there were many reasons; sometimes I was directed by Mr. Merritt, D. S. Merritt, in a general way as to the locality, certain localities to be covered.

Q. Yes.

A. In other cases there would be a problem, some problem, and the locations of stations would be left more or less to my own judgment, and I would act independently in selecting them.

Q. You say there would be a problem?

A. There would be a problem.

Q. Now, what was the nature in a general way of the problem, if you can summarize the nature of it?

A. I could not summarize the nature of all the problems that I have studied.

1180 Q. I ask for an explanation of some of the problems which induced your fixing upon locations for sampling stations?

A. For instance in line with my testimony on the last day here those samples—that sample that I was testifying on at the time, and several of the succeeding samples were taken on a cross section from Pier A on the Manhattan side to Communipaw on the Jersey side, taken through the phase of the tide at different depths, with the idea of obtaining the relative salinity of the water as an indication of its admixture of fresh and salt water, the mixture, and with the idea in view that those results would indicate the stratification of such, if any existed in the water, the admixture. That was a point in view. That was determined the day before I started out.

Q. In what particular cross section from Pier A to Communipaw, did you take your samples at regular intervals?

A. At regular intervals as far as possible and at regular times.

Q. Now how far about were the distances to those samples in that cross section?

A. I will have to have the field book of the Metropolitan Sewerage Commission of that time, in order to testify. It is also on the blue print, I think, that you have there, either one will do.

Q. Perhaps this is a more concise form.

(Counsel hands witness Complainants' Exhibit No. 12.)

A. I think that was sample No. 291, the first sample taken on that cross section, that was 291. That was the first.

Mr. O'Sullivan: Doctor, give the page.

The Witness: Page No. 8 of Complainants' Exhibit No. 12, and the serial number of the sample is 291. That was the first sample taken on the cross section between Pier A and Communipaw. Samples were taken approximately, the first series was taken approximately 500 feet off the Battery, and the next station selected
1181 was at midstream, the next about 500 feet from the Communipaw Coal Company's Dock, making three points in the cross section, and taking at each of these points samples from the surface and ten feet intervals to the bottom. At ten foot intervals from the surface to the bottom.

Q. In depth?

A. In depth.

Q. Now, on those samples what determinations did you make?

A. Determinations were made of the turbidity the color and the chlorine.

Q. And the problem in that case, I think you have already said was to determine the salinity or stratification?

A. To determine the salinity and from the salinity to judge of the stratifications using the salinity as an index.

Q. And on those samples you made the original notations of date and hour?

A. Date and hour and depth of sample.

Q. You numbered the samples as they were taken?

A. Numbered the samples serial numbers.

Q. And did you determine the turbidity?

A. I determined the turbidity.

Q. How did you do that?

A. By comparison in tubes with a standard solution.

Q. How did you designate the relative turbidity of the samples?

A. The turbidity, the figures in which the turbidity is reported throughout this work actually refer to a comparison with a standard turbid solution which contains one part—that is the unit is one part per million, a solution of silica.

Q. And what do the numbers 1, 2 mean?

A. They mean that this sample compared with two parts per million of standard turbid solution or 20 would mean that it compared with twenty parts per million of a standard turbid solution of silica.

Q. Now, take the three stations, where did you determine that there was the least turbidity?

A. The least turbidity was at the first station 500 feet off
1182 the Battery, and at the bottom and within ten feet of the bottom.

Q. Is that station located in the channel or not, 500 feet off the Battery?

A. I do not recollect. I could tell you that from the soundings.

Q. Where did you find the greatest turbidity in that cross section?

A. The greatest turbidity was at that same station on the surface.

Q. And you cannot tell whether as a matter of fact that was in the channel or not?

A. I do not remember. At the time that I took the samples I had the government charts with me in the boat and could tell whether I was in the channel or not, but I do not at present remember whether the channel is on the Manhattan side or nearer midstream.

Q. Had you personally located the outlets of any sewers on the Manhattan shore at about the line of your cross section?

A. No.

Q. You do not know then, whether there were sewers of the Borough of Manhattan discharging into the river or bay at that point?

A. I do not remember.

Q. You do not know whether there were or not?

A. (No answer.)

Q. Have you made any observations of the sewers discharging from Manhattan into the Bay and river?

A. I did in connection with another line of work.

Q. Those sewers discharge at what point with reference to the high or low tide?

A. You mean in depth?

Q. Yes.

A. What particular sewers are you referring to?

Q. Well, cannot you state generally as to the New York sewers, the Manhattan sewers whether they discharge at the surface, at high or low water?

A. Some of them discharge at the surface at low water and some of them below the surface.

Q. Well, how many have you investigated and found discharging below the surface at low water?

A. I cannot say from recollection.

1183 Q. Now taking the three stations which you have testified to on this cross section, which had the least average turbidity?

A. The least average turbidity appears to be on 500 feet from Communipaw.

Q. Communipaw, that is right, is it?

A. Yes, that is right apparently. Very little difference but it is apparent. That is right.

Q. Now, the determinations of color, Doctor, what is the standard by which you make your determinations—made your determinations?

A. I used the standard color solution known as the Hazen

Platinum Cobalt standard. The relative figures in which color is reported means so many parts per million of platinum solution. That is the basis upon which this color standard is made.

Q. Is that a very white solution?

A. White, it varies from the standard of one which is very white, to as deep a color as it is possible to compare. I have a range of colors.

Q. And they are numbered from 1 up to what?

A. They are numbered from 1 up to 70, is my usual scale.

Q. And 1 is very light, is it?

A. 1 is very light.

Q. And 70 is what?

A. Very dark, about the color of weak tea, not so very weak at that.

Q. I seem to see that you made more samples at 500 feet from the Battery than you did from either of the other samples, am I right in that conclusion?

A. You are right.

Q. How did that happen?

A. That happened from the fact that there was a greater depth of water 500 feet from the Battery than there was at other points.

Q. And that indicates what?

A. That indicates that the channel was in the neighborhood of 500 feet off the Battery.

Q. What is the greatest depth apparent at that sampling station?

A. 40 feet plus.

Q. The bottom you did not determine?

1181 A. The bottom evidently was less than 50 feet, according to my line.

Q. It is 40 feet plus on this standard 10, by your decimal system?

A. Yes.

Q. And at midstream that was your greatest observed depth?

A. 20 feet plus.

Q. And at Communipaw station?

A. 20 feet plus.

Q. 20 feet plus, now, on your first station within 500 feet off the Battery, your surface gave you 20 turbidity and 15 color?

A. I think your are wrong, a turbidity of——

Q. I thought you testified 20 was the highest at that station?

A. That was before I had the aid of this.

Q. Perhaps you had better correct that, that is as you did say, as I remember?

A. I think I did.

Q. Where did you determine the greatest turbidity on those three sampling stations for the purpose of correcting your previous testimony?

A. I should correct that by saying the greatest turbidity occurred at mid stream at a depth of 20 feet.

Q. Mid stream at a depth of 20 feet, and that would appear, would it not, to be within 10 feet at the bottom at that point, within 10 feet?

A. Yes, yes.

Q. And where did you determine the greatest discoloration on those places, those stations, at what depth, first as to the station?

A. At midstream and at the depth of 20 feet.

Q. The same location practically?

A. The same location has the maximum turbidity.

Q. Now, I asked you as to the greatest average turbidity, shown at the different stations, and I think you said it was the second, did you not, or did you say the first? I do not know whether I asked for the least or the greatest. I think I asked you the least. You determined from this chart?

A. I was using that erroneous figure.

Q. Do you want to correct that. Taking your determina-
1185 tions there, Doctor, will not you say where or at which station you found the least average turbidity?

A. The least average turbidity is at the first station, 500 feet off the Battery.

Q. That being the point at which the depth of the water was the greatest?

A. That is right.

Q. And where was the greatest average turbidity of the samples made by you on those three stations?

A. The greatest average turbidity was at mid stream.

Q. When you say mid stream, you mean substantially half way between the Battery and the Communipaw Dock?

A. That is what I meant.

Q. Yes, and now in the matter of color where did you find the least average coloring, discoloration of the three stations?

A. The least average color was found at the first station 500 feet off the Battery.

Q. And the greatest?

A. The greatest discoloration at midstream.

—. Now, turning to the chlorine determinations where did you find the greatest amount of chlorine?

A. You asked for the least——

Q. No, the greatest chlorine, the station and the depth?

A. The greatest chlorine at the first station 500 feet off the Battery average.

Q. At the bottom the greatest is at the 40 foot depth?

A. At 40 feet.

Q. And the next greatest?

A. At the bottom.

Q. That is at the first station. Did you make any other determinations on the samples taken on those stations at that time. They were all taken on the same day, were they not?

A. Yes, the same day.

Q. Did you make any other determinations?

A. No, I did not.

Q. Now, that was the one problem. What other problem did you attempt to solve by the locations of sampling stations?

A. The effect of trade wastes.

Q. The effect of trade wastes?

1186 A. For the presence of trade wastes.

Q. Now, what series do you refer to, as to that, if you can point it out?

A. I think it would take me some time to find out among so many samples.

Q. That is another problem. What other problem did you make an attempt to solve by the location—the taking of samples, series of samples. I am speaking now of the locations that you fixed yourself?

A. I think that covers the particular points that I fixed myself.

Q. As to the stations fixed by Mr. Merritt, you took your samples as directed?

A. As directed.

Q. As directed, you took the greatest number of samples, the greater number of the samples actually analyzed by you, did you not, personally?

A. Yes, I took the greater number of the samples myself.

Q. Now, of the greater number of the number that you took yourself, can you say in a general way as to what proportion were taken within 500 feet off the shore?

A. No, that would be impossible.

Q. You cannot say that, that of course could be determined?

A. From the records, from the note book.

Q. But you cannot say from your own observations as to that?

A. I could not.

Mr. O'Sullivan: Did you say observations or memory there?

The Witness: I said I could not say from my own recollection.

Q. Returning to this series that you have referred to on the question of turbidity and color for the purpose of determining the stratification and other things, what season of the year was that taken?

A. That was taken in the Spring.

Q. In the spring, did you make any attempt to determine the source of the discoloration, the cause of the discoloration, perhaps that would put it better?

A. I did not.

Q. Nor any attempt to determine the cause of the turbidity?

A. No.

1187 Q. Is there any other series of observations taken and shown by the charts, the locations of the stations determined by you for the purpose of indicating the same general problem, or determining the same general problem as you sought to determine in these samples 291 to 301. Can you point out another series?

A. The 77 samples from 291——

Q. 291 plus 77 would make 368.

A. Well, all samples taken on page 8 of Complainants' Exhibit No. 12, with the exception of the first two, were taken for that purpose. All samples on page 9 were taken for that purpose, and all samples on page 10. The samples on page 11, including No. 444 were taken for the same purpose; those are all I see at present, there may have been others.

Q. And did you locate the sampling station for all those samples?

A. All those samples were located by us when those samples were taken, determinations by me.

Mr. O'Sullivan: What pages were you alluding to, what exhibit?

The Witness: Complainants' Exhibit No. 12, pages 8, 9, 10 and 11.

Q. You have given the first cross section. Will you give the second cross section as shown by the chart or table before you?

A. The figures composed in those pages I think comprise two cross sections at that point on separate days, from the same location, on the 23rd and on the 25th.

Q. And the samples were taken then on these cross sections at different hours on two different days, is that the fact?

A. The cross sections were taken——

Q. The samples were taken?

A. The samples were taken at the three stations testified to at the depths of 10 feet from the surface to 10 feet to the bottom, every 10 feet to the bottom, and at every hour during the day.

Q. Beginning at what hour?

A. Beginning at 10 A. M. on the 23rd of April, and continuing until 4 P. M. on that day.

1188 Q. Yes.

A. Beginning at 10 A. M. on the 25th of April and continuing until 4 P. M. on the 25th.

Q. Now, where was the second cross section located at which you took hourly samples at the different depths?

A. The second cross section taken on the 25th was located at the same point as the cross section taken on the 23rd. The location of the points should correspond.

Q. Then all the samples were taken at the same depths at the same stations on different days and hours?

A. At the same stations on different days.

Q. At the different hours?

A. And at different hours.

Q. Would you be able to tell without examination, which, perhaps I might make as well as you, from your memory can you state where the least, at which station the least turbidity was shown by the samples. I do not want you to go over the whole thing.

A. No, I have not the figures in my mind.

Q. And the same would be true with regard to the discoloration?

A. Yes.

Q. And also as to the chlorine?

A. It would.

Q. That can be determined by comparison of the charts or the tables?

A. Yes.

Q. Doctor, have you gone over these tables which are before you in blue print form, so as to be able to tell whether all the samples taken, of water I speak of now, are reported on this table?

A. All of the samples of water which I took are reported on this table.

Q. And were all the samples of water which were sent to your laboratory examined by you and reported on?

A. They were, and they are included in this table.

Q. And they are all included in that table?

A. All of the water examinations are included in that table.

Q. Several of the pages of these tables are covered by your testimony on that particular problem of stratification and salinity. Now, having the table before you, cannot you point out
1189 some series of determinations of the second problem of trade wastes?

A. I might say that most of the samples taken in Newtown Creek were taken with that point in view. On page 12 of Exhibit No. 12, I recognize samples showing trade wastes.

Q. And what are the numbers?

A. 452 to 455 inclusive.

Q. And where were they taken?

A. Taken on Newtown Creek, from the drawbridge to along the creek to Greenpoint Avenue.

Q. And this other one that is not included?

A. No.

Q. Did you take those personally those samples?

A. I took sample 454 personally.

Q. When was that taken? And where was that taken?

A. Meeker Avenue Bridge.

Q. Were you familiar with Newtown Creek at the time these samples were taken?

A. I was, been there before several times.

Q. There are a large number of manufacturing plants located on Newtown Creek?

A. Yes.

Q. Where else did you take samples for the purpose of determining the presence of for the detection, or whatever the problem was with reference to the trade wastes?

A. In the neighborhood of the gas houses on the East River, that is on the Manhattan shore of the East River.

Q. Where are they with reference to any of th bridges across the East River, the gas houses?

A. They are north of the Williamsburg Bridge.

Q. North of the Williamsburg Bridge?

A. The first one is at the foot of 14th Street, the first gas house, extends from 14th Street to 16th Street. The next one is from 20th Street to 22nd Street.

Q. And did you take any samples for the determination of that problem at any other point except the two that you have named?

A. I remember taking samples on the Manhattan shore of the East River up near the Blackwell's Island Bridge, the slaughter house district.

1190 Q. That is further north?

A. Further north.

Q. Any others?

A. Yes, I remember taking samples in Gowanus.

Q. Gowanus Canal?

A. Gowanus Canal, and those are the only samples that I recall taking personally in this connection.

Q. Did you take any samples in Newark Bay?

A. No.

Q. Or in the Kill von Kull?

A. No.

Q. Did you examine any of the samples taken by you or submitted to you for the purpose of determining the amount of free oxygen in them?

A. I made no oxygen determinations in my work there.

Q. Were any oxygen determinations made to your knowledge of the samples which passed through your hands?

A. Not to my knowledge.

Q. The samples are shown on the tables that you have before you, are those the original numbers?

A. Those are the original serial numbers as they appear on the field book.

Q. And I take it that the numbering in the field book was made——

A. (Interrupting.) At the time of the collection of the sample.

Q. Made in the field?

A. Made in the field.

Q. At the time the samples were taken?

A. Yes.

Q. And so far as you know there has been no change made in the numbering?

A. No change could have been made and have all the books agree.

Q. And you have examined these tables sufficiently and compared them with your original notes?

A. Compared them sufficiently to satisfy me that the tables are right.

Q. That the tables are right. In making your laboratory determinations on the samples taken and submitted, taken by you and submited to you, did you follow instructions or did you follow your own judgment?

A. I followed instructions when instructions were given definitely, but as a matter of routine work, methods were discussed by Mr. Merritt and myself sometimes Mr. Provost, and Pro-
1191 fessor Landreth, and it was agreed as to what methods should be followed. I either did as the commission agreed or as they dictated.

Q. You did not yourself attempt to determine what features you were to undertake to determine by tests and examinations?

A. The commission determined the object of the examination, and I made the examination.

Q. So you cannot say why no attempt was made on this large series of samples to determine the free oxygen in them?

A. I made no examination.

Q. I say you cannot tell why it was not done?

A. No, I cannot.

Q. Now, there were some determinations of the mud samples, I think you testified to those, where is that table, Doctor, please?

Mr. O'Sullivan: It is Complainants' Exhibit No. 14, dealing with mud samples.

Q. I place before the witness Complainants' Exhibit No. 14. Will you state, Doctor, what part or parts of the numbered sheets included in this exhibit, represents determinations made by you?

A. In complainants' Exhibit No. 14, on samples in serial numbers from 12 to 567 inclusive.

Mr. O'Sullivan: On what page?

The Witness: On page 13. I made all of the determinations of the loss on ignition, color, odor, and such remarks as may accompany each sample.

Q. Did you take any part in securing the samples which are treated and analyzed or otherwise commented on?

A. I took personally samples 461 to 464 inclusive, 620 to 625, 626 to 639, sample No. 659, samples 660 to 664 inclusive, samples 699 to 705 inclusive.

Q. And the several determinations which appear to be indicated by the charts or tables were they fixed upon by you, or were you directed what to do with reference to the samples?

1192 A. I was directed what to do in the same manner as I stated in regard to water samples.

Q. And the places from which these samples were taken, did you determine those places or were they determined for you?

A. In the majority of instances they were determined for me.

Q. And in the instances in which you determine- them, what purpose, if there was a general purpose influenced you in making the determinations of locations?

A. I had the general object of taking the samples in mind and I made my own locations according to my judgment when I arrived at the spot.

Q. What was that general object that you had in mind?

A. Selecting samples which would represent the average condition of the bottom over the area to which I was assigned for the day on.

Mr. Riker: Is there a chart showing these mud sampling stations in evidence? I think there is.

Mr. O'Sullivan: I tender to Defendants' Counsel Complainants' Exhibit No. 16, which sets forth the serial numbers of all the water and all the mud sampling stations.

Q. Did you have anything to do with the preparation of Complainants' Exhibit No. 16?

Mr. O'Sullivan: One moment. I also offer to Defendants' Counsel Complainants' Exhibit No. 18 being Sheets 1 to 16, which are the plottings of the original sampling stations for both mud and water, as testified to by Mr. Merritt, who prepared the map from which these blue prints were made at the last hearing.

Q. Did you have anything to do with the preparation of them?

A. I had nothing to do with the preparation of these maps.
Q. Do you know whether they are correct or not?
A. I do not.
Q. You have not attempted to verify them?
A. I have not.
1193 Q. Will you turn to the samples which you took personally. I mean will you turn to the record of the samples, which you took personally and tell me where the different ones were in fact taken and the depth of the water at the point where they were taken, if you have the depth?
A. Sample No. 461 on page 10 of Complainants' Exhibit No. 14 was taken on the 6th day of June, 1907 from the slip at 10th Street and the East River at a depth of 12 feet.
Q. Now, at that time, what was the use to which the slip in question was devoted, if you remember?
A. I do not think I can remember.
Q. Was it a ferry boat slip?
A. I do not remember any ferry at Tenth Street.
Q. Do you know whether there is a sewer discharging into that slip?
A. I do not.
Q. How did you come to locate a sample as to be taken from that particular point?
A. It is rather a long time ago for me to remember my reason for taking a sample there.
Q. Now, will you turn to the next serial number that you took?
A. 462, the succeeding sample.
Q. Where was that taken?
A. At 23rd Street on the south side of the recreation pier.
Q. In the slip?
A. In the slip I think.
Q. And at what depth?
A. At a depth of 15 feet.
Q. Is that a ferry slip if you remember?
A. That is used by the Atlantic Yacht Club, as I remember. The ferry slip is adjacent to it on the south.
Q. Do you remember whether there was any sewer discharging into that slip?
A. I do not.
Q. Do you remember why you fixed upon that point as a proper place for a sample of mud?
A. Yes, on account of its being a recreation pier, and on account of the large evolution of gas from the water which I had observed there at that time going on. I considered it of interest to know the condition of that slip.
1194 Q. And why did you not consider it of importance to know whether there was a sewer discharging there when you had observed all those facts?
A. That information was available in the office, from the charts of the Sewer Department which we had on file for ready reference.
Mr. O'Sullivan: I do not hear you Dr. Miller.

The Witness: Those charts were on file at the office, and were available from the Sewer Department.

Q. Now, will you turn to the next sample in serial number which you took personally and tell me where that was taken?

A. No. 463 was taken at mid stream opposite 42d Street in the East River.

Q. At what depth??

A. The depth is not recorded on this exhibit. It may appear in the field books.

Q. Have you your field notes here of that examination?

A. The field note books are here in this bundle.

(Witness opens bundle of field notes and examines same.)

Q. I want to get the depth of that sample, if I can. Can you find it, Doctor?

A. Yes, the depth appears to be 40 feet.

Q. Now, will you look at your original notes and tell me what notation you made with reference to the general character of the sample; perhaps you did not make it on your original field notes?

A. Yes, Sandy surface, dark brown color, those are the original notes.

Q. Dark brown?

A. Dark brown.

Q. That is sample 465?

A. 463.

Q. 463, well I draw your attention to the fact that the color notation in your chart or table here, your notation of color is light brown?

A. The laboratory record on the sample is light brown.

Mr. O'Sullivan: What sample?

The Witness: No. 463.

1195 Q. Did you make the laboratory record?

A. I made the laboratory record.

Q. Were changes in color noted so that you remember it in other samples taken?

A. I do not think I understand the question.

Q. I mean with the drying of the sample did you note a change in color in any other sample, or for any other cause, between the time when you took the sample and made your field notes and the time when you examined it in the laboratory and made your laboratory notes?

A. Yes, the color of the mud frequently does change.

Q. Is that your explanation of the difference in your field notes and laboratory notes?

A. That would be my explanation.

Q. And your colors as shown on your tables, are those colors that were determined at the laboratory or at the taking of the sample?

A. Those are the colors determined at the laboratory.

Q. What was the purpose of taking any field notations in your field notes?

A. For comparison.

Q. Where was the comparison made of any of the coloration, in the field at the taking of the sample and the coloration at the laboratory examination?

A. I do not remember any record of such comparison.

Q. It is not charted in any way on the tables?

A. Not that I know of.

Q. Did you in making your field observations have any standards by which you made your notations or did you take the general appearance as a standard by your own perception?

A. Take it that way.

Q. And in the laboratory in the same way?

A. In the same way.

Q. It does not make a great deal of difference, it is not
1196 of a great deal of importance one way or the other, is it?

A. Not generally.

Q. Now, in determining the odor of the samples of mud, were those determinations made by any scientific method?

A. That is something very difficult to put down in a scientific scale, odor.

Q. You do not know of any standards for odor determinations?

A. I know of no definite standards. There is not an agreement upon practitioners as to odors.

Q. When and where did you make your determinations of odor on Sample 463?

A. Made in the laboratory.

Q. It noes not appear in your field notes?

A. No.

Q. Will you describe what you intended by your notation of mouldy on that sample, if you can designate it any more explicitly than just by the use of the word "mouldy"?

A. I think the term "mouldy" explains itself.

Q. Well, now, what particular definition of mouldy did you apply in your sense perception of the odor of this particular sample? Was it mouldy as of cheese or mouldy as of earth?

A. Mouldy as of decomposed vegetable matter.

Q. Mouldy as of decomposed vegetable matter?

A. That is what I mean by the term mouldy.

Q. You perceive on your examination that the sample has an odor which you identify with the odor of decomposed or decomposing vegetable matter?

A. Yes.

Q. What other observations did you make of that particular sample?

A. Loss on ignition of the mud, dried mud, as given in parts per million by weight.

Q. Won't you explain, so that perhaps I can understand it, what your method of making these determinations is and what your standard is?

A. The muds are dried at a temperature of 105 degrees centigrade, and a definite portion of dried mud is weighed in a porcelain crucible.

1197 Q. What is that standard amount, it is a standard amount?
A. No standard amount.
Q. Very well.
A. And that mud is then ignited at low red heat for an hour.
Q. The heat is applied to the outside of the crucible, I suppose?
A. To the outside of the crucible.
Q. You do not put any flame in it?
A. No flame into the crucible, the crucible being covered when ignition is started, and the lid removed after the first organic matter has burned off.
Q. Did you state what temperature it was subjected to?
A. Low red heat. That is the crucible itself is not allowed to attain a heat over low redness.
Q. How long was that heat applied to that particular sample?
A. Applied for an hour.
Q. One hour?
A. One hour.
Q. And then what do you do with the contents of the crucible?
A. The crucible with the contents is then placed in a dessicator and allowed to cool. After cooling it is weighed and the loss in weight calculated back to percentage, the loss per dram, calculating the actual loss compared with the weight actually taken, compared—reduce it to loss per dram.
Q. How many such determinations did you make of mud samples in the series shown by the tables contained in Complainants' Exhibit No. 14?
A. Such determinations were made, I believe, on all mud samples from No. 12 to 567 inclusive. I think they all had loss on ignition. There might have been a few exceptions when the general nature of the sample seemed to show that such determination would be of little or no value, or it would seem to be impossible.
Q. I see the loss on ignition of this particular sample is put on this table at 14,340, can you state from your recollection whether
1198 that is a very low loss on ignition or not as compared with the samples taken and treated by you?
A. A very moderate loss on ignition.
Q. Very low, is it not?
A. Very low.
Q. Does that method of determination of the loss determine whether the sample has been affected by organic, by animal parts, or the contamination of vegetable matter or both?
A. It shows the measure of both animal and vegetable combined.
Q. You do not distinguish in any way, you cannot distinguish by that test as to whether the contamination is animal or vegetable in origin?
A. The loss of organic matter.
Q. Simply the loss of organic matter. Will you turn to another sample, the next one you have of mud, that was made by you, where the sampling was made by you?
A. 464, serial number 464 was the next sample taken by me.

Q. Where was that taken?

A. That was taken in Newtown Creek above the Meeker Avenue bridge.

Q. Saturated with oil from the Standard Oil Refinery?

A. A great deal of oil on the surface.

Q. Can you state the depth at which you took that sample?

(Witness examines field notes.)

A. I have got it.

Q. What is the depth, 15 feet?

A. 15 feet.

Q. Did you make determinations of discoloration in your field notes, I mean did you make memoranda of the color?

A. Black.

Q. Black oily ooze, is it not?

A. Yes.

Q. And I think you said that that was taken near by the Standard Oil Refinery?

A. Yes.

Q. And your laboratory determinations of odor, what were they?

A. The laboratory, that was an odor of gas, hydrogen sulphide gas.

Q. A rotten egg smell?

A. The rotten egg smell, yes.

Q. And your loss on ignition in that sample was what?

A. 260,000.

1190 Q. That is very high, is it not?

A. Very high.

Q. Showing a large amount of organic contamination?

A. Yes.

Q. Doctor, what useful purpose in your opinion is served by an attempt to determine the odor of the samples?

A. The odor of a sample is frequently of use in determining its stability, whether it contains putrescible matter or not, how long it has had it, contained it, what degree of breaking down, decomposition exists, and very often a well defined trade waste may be detected.

Q. That is rather an unscientific method of arriving at the conclusion?

A. In connection with definite figures it may become very scientific. It is no less scientific in my opinion than the visual appearance.

Q. Yes,—well, do you think that you are able to determine from a sample of mud taken from the bottom of the bay as to the contamination and the character of it?

A. At times I am.

Q. In any accurate way?

A. It directs my future work.

Q. Doctor, has there ever been a sample of earth submitted to your examination for determination of odor which did not show some odor?

A. No, all earth has some odor.

Q. All earth has some odor. Now, in using your olfactory or-

gans upon the samples in question, did you attempt to determine any particular forms of odor as present in the samples?

A. I have noted a number of instances where the odor was distinctive. I have noted a tarry odor. I have noted a distinct odor of kerosene. I have noted the odor of gas refuse, gas tar, which is a well defined odor, distinctive. I have also noted the presence of hydrogen sulphide gas, another easily identified odor.

Q. Yes, that is true.

A. There may be other instances there,—those I recall.

1200 Q. What in your judgment is indicated by the presence of the odor which you define, or which you indicate as mouldy?

A. Decomposition of organic matter.

Q. What kind of organic matter?

A. Usually vegetable.

Q. Why did you select Newtown Creek as the location for a sample for this examination?

A. I considered Newtown Creek to be a very fruitful source of contamination as a whole, the harbor, and therefore, one of the districts to be covered in a general examination.

Q. You had determined that, had you not, from actual observation and examinations of the creek itself, without applying any scientific methods?

A. Simply walking over through that district.

Q. Did you find the sample that you took from the bottom of that creek, being the number that we have been dealing with, any different from what you expected to find it?

A. I had no preconceived opinion as to the exact percentage I would find.

Q. You were not surprised to find that it was black oily ooze?

A. No.

Q. Now, I will have to ask you to take the next sample in order that you made yourself?

A. That I collected?

Q. Yes, sir, where you made the sampling, the sampling that you made. Confining it to the ones you took yourself.

A. Yes. The next sample taken by me was No. 620, but I find no record of any chemical work done by me on the sample.

Q. What induced you to take that sample?

A. It was taken for the use of the laboratory, for the bacteriologist, all the work done was of a bacteriological nature.

Q. By the direction of some one else?

A. Yes.

Q. You did not locate the station yourself?

A. No.

Q. Did you take any others?

A. These samples 620 to 625, were taken on the same day for the general purposes of the laboratory, but no chemical work was done on them. (Witness examines field note books and tables.)

A. (Continuing:) For bacteriological work.

1201 Q. In fixing the mud samples which you yourself took, how much in depth of the mud did you bring up in the sample, do I make myself clear?

A. I think so. (Witness refers to field book.) My recollection is of those samples approximately a gallon capacity, a gallon in volume was brought up from the bottom, and the laboratory sample taken from that.

Q. What I want to get at is, as to what depth below the actual top surface of the mud itself the sampling instrument penetrated?

A. The sampling instrument penetrated to a depth of about a foot in those cases where I took the samples.

Q. And how do you determine that, Doctor, what was there about the sample or the method of sampling, which indicated to you that the instrument reached a depth in the mud of a foot?

A. The general construction of the instrument and the dimensions of it.

Q. Was that about the limit of the capacity of this instrument to sample, in depth?

A. Some of the samples that I took in connection with others, that I assisted in taking, they penetrated several feet below the surface. I do not recall what the extreme depth was, what was possible. I know it was several feet.

Q. How were you able to determine that fact?

A. By the number of ports in the instrument containing mud. That is the instrument would be sent to the bottom, or as far down in the mud as possible, the ports opened, and the mud allowed to enter and the ports again closed, and the sampling apparatus brought to the surface, and when it was opened, we would find mud in the first compartment from the bottom and in each succeeding compartment up to the surface of the mud. The compartment above that would be filled with water. In that way the total depth that the instrument had penetrated could be measured.

Q. Did you make any notation on your field notes of the

1202 depth of penetration?

A. I think in every case.

Q. It is not shown on the charts. I speak of those charts and the tables?

A. I do not know. It may be. I did not make all those notations, and therefore I have not gone over that column in the chart.

Q. You have here a book of yellowish paper with ruling on it?

A. That simply contains the chemical determinations. It has no record of the physical aspect. Those were made in the field books.

Q. You have not before you the field books?

A. I have, and that contains the depth of that mud whenever it was noted.

Q. Will you turn to sample No. 464. I think you have it open before you?

A. Yes.

Q. Does that show the depth of the mud?

A. That does not show the depth of the mud. Only one sample taken at that point.

Q. Will you turn to sample No. 463 and say whether that shows the depth of mud penetrated?

A. It does not.

Q. Will you turn to the one before that, 461, you took that yourself?

A. No.

Q. 462 then?

A. Yes, 461 I did.

Q. Does it give the depth of penetration?

A. It does not.

At 12:30 o'clock adjourned for noon recess to 2 o'clock P. M.

1203 December 27th, 1911.

Afternoon Session, 2 p. m.

The Commissioner: Will you resume, Mr. Riker?

Mr. Riker: Yes, sir.

The Commissioner: Doctor, resume the stand, please.

P. SCHUYLER MILLER, a witness on behalf of the complainants recalled for further examination, testifies as follows:

Cross-examination (continued) by Mr. Riker:

Q. You told us, Doctor, of some mud sampling that occurred under your direction, your observation where the instrument was driven several feet into the mud of the bottom of the bay?

A. Yes.

Q. Can you state where those places *where?*

A. A great many samples were taken with that instrument. It is already in evidence, the general plan of construction. Complainants' Exhibit No. 15 is a detailed plan of the instrument to which I referred a couple of hours ago.

Q. I ask where the samples were taken if you can recall, where the instrument was driven into the mud several feet?

A. I can recall by reference to the form.

Mr. O'Sullivan: What are you referring to?

The Witness: I am referring to the time the samples, which were taken with the instrument I described in Complainants' Exhibit No. 15 were taken.

Mr. O'Sullivan: And you are consulting what now?

The Witness: I am consulting Complainants' Exhibit No. 14. This sampling apparatus required the combined services of at least two men for its operation, and for that reason I have to consult the record a little carefully in order to determine when it was there.

Q. (Question repeated by the stenographer as follows:)

"Q. I ask where the samples were taken if you can recall, where the instrument was driven into the mud several feet?"

Mr. Riker: When you were present.

1204 A. When I was present?

Q. Yes, I was not asking you for anything when you were not present. You said on several occasions you were present when the instrument was driven several feet into the mud. Now, I ask you where the samples were taken in your presence in that way?

A. The first samples that come to my attention were taken on 17th of April, 1907, with that instrument in Gravesend Bay.

Q. And can you locate the place more accurately from your field notes?

(Witness examines field notes.)

A. That will require reference to this.

Q. You have got it here on this print, have you not, will not you be able to say whether that is right or not, 100 feet from the Marine Dock?

A. 100 feet from the Marine Dock, from my recollection, that is right.

Q. Who was with you on that occasion?

A. Dr. Parsons was with me on that occasion.

Q. Any one else?

A. And the crew of the boat.

Q. At what depth was that sample taken or those samples, there are several of them, are there not?

A. The samples from 255 to 260 inclusive, represent the same location and depth of mud was taken from the various compartments of the instrument at the relative distances indicated in the fourth column, ranging from the surface of the mud to the bottom of the mud, or so far as we are able to penetrate with the apparatus.

Q. And at what depth of water?

A. A depth of 6 feet.

Q. 6 feet, what device or method was used by you or your associates in driving the instrument into the mud at the depth of 6 feet of water?

A. The combined weight of two men on the apparatus.

Q. What was the length of the apparatus used at that time on that occasion?

A. The apparatus is adjustible to the depth which you are 1205 working. The length of the portion containing the sampling compartments is indicated on Complainants' Exhibit No. 15.

Q. Well, what is that depth indicated, or length?

A. And if necessary to go beyond that additional sections were added.

Q. Well, what is the length indicated on your papers that you are referring to?

A. This is the first time that I have seen this exhibit, and the depth seems to be in the neighborhood of 6 feet, 12 feet from the surface of the water. That is the active distance according to this

plan, which as I say, I see now for the first time, this is the first time I have seen it. I remember the instrument.

Q. Recalling the instrument in actual use, what was the length of it as used on the occasion that we are now directing attention to, the sampling in Gravesend Bay, 100 feet off the Marine Dock?

A. My recollection is that the instrument had in its first section a length approximately of 10 or 12 feet with provision made for extending that to any length convenient.

Q. What were the limits of the convenient length you speak of. How long could they make it?

A. You could make it as long as the sections you had on board and as your physical strength was capable of controlling it. There was essentially no limit in the construction of the apparatus as to the depth at which it might be used.

Q. It consists of sections of pipe, does it not, one put into another?

A. The lower section which contained the sampling compartments. Above that it consisted of sections of pipes which might be inserted, screwed one to another, and would enable you to use it at any depth convenient.

Q. Now, on how many occasions were you present when the sampling instrument was used?

A. From recollection I cannot testify, but I can testify that it was on a great many occasions.

1203 Q. This particular device was abandoned, was it not, before you got through with the sampling?

A. Yes, for very good reasons.

Q. Well, having suggested a very good reason, what was the very good reason?

A. The very good and essential and main reason was that our appropriation no longer permitted us to use a boat with a derrick on the forward deck which would enable two or three men to handle it conveniently.

Q. It was too expensive?

A. It was too expensive to use at the time.

Q. Now, of the samples of mud that were submitted for your examination were taken from the Bay—what proportion do you know were actually taken by that sampling instrument?

A. The total number of samples taken from the Bay?

Q. Yes, mud I am speaking of?

A. I have made no estimate of the total number of samples taken.

Q. When that was abandoned for economic reasons, what device did you use for sampling the mud?

A. We used a device which I think has been described by Mr. Merritt, and which I believe was suggested to him. The simplest terms in which I can describe that device perhaps would be to say that it is like a cheese borer or butter sampler. That it was composed—it was constructed of pipe, galvanized iron pipe of an inch and a quarter, perhaps an inch and a half in diameter. The lower ten or twelve feet being cut off longitudinally, the portion removed a little less than half the diameter. This could be attached to other

pipes in order to lengthen it in the same manner that Professor Lendreth's apparatus was for any depth in which we might be working. The manner of operation was to lower this borer alongside of the anchored vessel, striking the mud in as nearly a perpendicular line as possible, and driving it into that mud, so far as we could, then revolving it and drawing it on deck and taking the samples for examination, from the samples brought up and
1207 contained in the trough of the pipe.

Q. Was it in the nature of a gimlet or spiral of any kind?

A. It was not in the nature of a gimlet or spiral. The type of instrument is well recognized and is a standard type of sampling apparatus. It is a type recognized by the Department of Agriculture for the sampling of cheese, for the sampling of butter, also by the custom house for the sampling of hogsheads of sugar It is in constant use by the Custom House Department in the sampling of sugar.

Q. Was there anything about it which indicated the depth of the particular part of the sample below the surface of the mud?

A. The contents of the tryer—it is technically called a tryer by the Custom House Department, and the length of the sample, the total sample, would indicate the depth of the mud sampled, and the application of a foot rule from the bottom to the point where you took your sample would indicate the depth at which the sample was taken, and in that manner the total depth of the mud.

Q. Well, with this particular instrument can you say what depth, what extreme depth of mud was sampled in your observations?

A. I think, in fact I can remember that the instrument was capable and successful in bringing up samples of from 5 to 6 feet, possibly more.

Q. Now, can you locate any of the places where the samples of that depth were taken, actually taken under your observation?

A. That would be pretty difficult on this record. It would take a great deal more time than it took me to find the depth of the water in Newtown Creek.

Q. Why?

A. It is recorded there either in this report or in the Engineer's report.

Q. You have seen it?

A. I know it is recorded.

Q. I ask you whether you have seen it?

A. It is recorded it is in the original record.

Q. I ask you whether you have seen it in the tables be-
1208 fore you or in the Engineer's report?

A. Not in the tables before me.

Q. It is not in the tables before you?

A. It may not be in the tables. I will correct that. I will not say that it is not in the table before me, but my attention has not been called to the fact that it is in the table before me.

Q. So far as you know, you have not seen it in the table?

A. So far as I know I have not seen it in the table.

Q. Now, you pointed out a series of samples in Gravesend Bay where there appears to be samples at different depths and on the surface of the mud. Can you point out another one that was taken under your direct supervision and observation where the depths of the mud exceeded a foot?

(Witness examines tables.)

A. The samples Nos. 400 to 405, 15th of May appear familiar to me. They were taken with that apparatus. They were taken from the surface to 5 feet. That is a total depth of 5 feet in the mud.

Q. Were you present when they were taken?

A. I recall that trip.

Q. May 15th, 1907?

A. May 15th.

Q. Can you refer to your field notes on that particular lot of samples?

A. They may appear in the field notes, but as no chemical samples were taken——(Witness examines field notes.) (Continuing:) The field notes do not appear to be in my own handwriting, therefore, I can simply testify——

Q. You were there when they were done?

A. To the best of my recollection I was present and assisted in the sampling. I did not make the notes at the time, but I remember being there.

Q. Where were the samples taken?

A. They were taken near the Jersey Central Railroad Station.

Q. How far from the shore?

A. Testifying from recollection approximately 500 feet off shore.

1209 Q. Who furnished the material for that chart so far as it refers to those particular samples, do you remember?

A. Are you referring to the original notation in this field book No. 2 of the Metropolitan Sewerage Commission?

Q. Yes. Do you recognize the handwriting?

A. It rather looks to me like Mr Merritt's handwriting.

Q. And I observe on this blue print which is marked Complainants' Exhibit No. 14, on the 8th page opposite Sample No. 400, something that looks like Mockel Dock; does that identify the place in any way to your recollection?

A. No, I do not remember.

Q. Do you remember whether or not the samples were taken from a dock?

A. I think they were not taken from the dock, because I have testified that it is my impression they were taken away from the dock.

Q. At what depth of water?

A. As I did not measure the depth of water, I cannot testify to it. It is rather shallow over there.

Q. What was the laboratory observation of the character of the bottom on the samples taken out, was there any?

A. The observation on sample No. 400 was black color, odor of sewage, marked sewage odor and gas odor.

Q. What kind of gas?

A When I refer to gas odor, I refer to the quite distinctive odor of gas refuse.

Q. That is illuminating gas refuse?

A. Illuminating gas refuse.

Q. There are no remarks on the physical characteristics outside of the color and odor.

A. None appear on the exhibit and none appear on my laboratory notes.

Q. Well, you have no recollection of why you made no notations under general characteristics of this particular sample?

A. No recollection why I made no additional memoranda.

Q. Does the reference to the field note book refresh your memory as to the character of the samples?

A. I cannot say that it does.

1210 Q. You cannot now say anything as to the character of these samples, except what appears in your own laboratory notes?

A. Except what appears in the exhibit and is corresponding with my laboratory notes.

Q. I think you said the samples were taken in comparatively shallow water, did you not?

A. Yes.

Q. About what depth do you define comparatively shallow water in that connection?

A. 15 to 20 feet I consider comparatively shallow water.

Q. Do you think these samples were taken at that depth?

A. I think possibly so.

Q. That location is along the low Communipaw shore, is it not?

A. It is well defined on the map.

Q. That is in a general way a proper description of that location, is it not?

A. Yes.

Q. And the general average depth of the water is small, is it not, in those locations?

A. That is my impression of it; it is some years since I have been there.

Q. What station were those samples taken at, can you tell?

A. I cannot give the station number; it does not appear on this exhibit.

Q. Have you got it anywheres that you could identify those samples with the station number?

A. I had nothing to do with the establishment of station numbers.

Q. Did you attempt to trace the origin of this illuminating gas contamination of the sample?

A. No, I did not.

Q. Do you remember whether you noticed at the time when the samples were actually taken?

A. Noticed what?

Q. The odor of gas? In the refuse, the odor of gas?

A. My recollection is that I did not note the odor of gas at the time of taking of the samples, but after I proceeded to examine the bottle containing the sample in the general laboratory examination.

Q. You would not be able to say definitely how long that

1211 was after you took the sample?

A. I think my manuscript report to the Secretary of the Commission will settle that. It is here, but is somewhat obliterated, in pencil, the day I reported it. It looks like two days. Within two days of sampling. The manuscript report is in here and that would give the maximum time from the taking of the sample to reporting upon it. As a matter of fact in all these observations, the physical, the general physical characteristics, which include the odor, are the first thing obtained. The loss on ignition required taking the samples in lots of fives and tens and fifteens as it was my habit to do. That would require usually half a day, subsequent to the determination of the physical characteristics, so that if this was reported, as it appears in my laboratory record, on the 17th and the samples were taken on the 15th, as appears in the Field Book No. 2 of the Metropolitan Sewerage Commission, at that time, I believe that the odor was determined within 12 to 18 hours after the collection of the samples.

Q. Did you endeavor to determine in the sample itself the origin of the gas odor?

A. I did not, in that sample, so far as I recollect.

Q. Did not you determine whether it was refuse in the sample or whether it was impregnation of the escaping gas?

A. Escaping gas, from what source?

Q. I do not know, I cannot tell. It may have been from your gas pipes in your office for anything I know?

A. Escaping gas from my office cannot penetrate a glass bottle securely corked or impregnate the contents of it. The odor that came from the mud in my opinion, was in the mud as originally collected, and not any odor that it had acquired in transit or during storage of 12 or 18 hours.

Q. Then the samples of mud that you examined were subjected to an ocular and olfactory examination and you made notes on those and afterwards subjected it to the loss on ignition test and that

1212 is all you did?

A. On the greater part of them, the great majority of them.

Q. What did you do with any part of them not included in the great majority?

A. I made some special examinations in collaboration with Dr. Parsons, with a view to determining any antiseptic properties which those muds might have.

Q. Antiseptic or septic?

A. Antiseptic that those muds might have, and that report was— all that work was embodied in a special report to the commission of which I have been unable at the present to find the original data. They are among my special notes but I have been unable to get the original data available for this hearing. I may be able to find them.

Q. The results are not included?

A. The results I have not seen included in any of the exhibits so far. That was work not done enitrely by myself, but in collaboration with Dr. Parsons.

Q. How long a period of time did the various examinations of water and mud samples which have been testified to by you cover?

A. Do you refer to the period of my connection with the Metropolitan Sewerage Commission, 1907?

Q. Perhaps I should be a little more definite, determinations of the samples of water as set out in Complainants' Exhibit No. 12, and of mud as shown in Complainants' Exhibit No. 14, how long a period of time did those cover?

A. The work done in connection with Complainants' Exhibit No. 12 and Complainants' Exhibit No. 14, personal work done, was comprised between the first of April, 1907 and about the 15th of November of the same year.

Q. Have you attempted to total the number of examinations made by you?

A. I have, and I have testified as to the total.

Q. How many was it?

1213 A. It is already a matter of record. I would have to refer to my notes again, as I did before. I do not know as they are available. It is already a matter of record. Perhaps I can find them if it is essential.

Q. And during this period you assisted at the taking of the samples, there were a good many cases?

A. I assisted at the taking of some samples which I have designated already. I examined them in the manner that I have indicated certain samples.

Q. And every sample that you examined was subjected to several different processes or observations, was it not?

A. I have already gone into it quite fully, I think, just exactly what those were.

Q. Did you assist in making the float observations?

A. I did, at a few of them.

Q. Were you engaged in any other work during the same period?

A. While I was taking the float observations?

Q. No, during the period that you have testified to in May, I think it was or April I think it was to November 1907?

A. I was engaged in the laboratory work.

Q. Outside of what you have been testifying to here, the work you have been testifying to, did you have any other work to do; did you do other work?

A. In connection with this problem?

Q. Either with this problem or with any other problem, or any other employment?

A. I have been consulting chemist for something over 15 years, continuously.

Q. Well, did you do anything in that line of work during the period covered in your testimony?

A. Yes. Hardly a year has passed in the last 15 or 20 years that I have not done work aside from special salary engagements.

Q. And during the months covered by these examinations did you have consulting work to do?

A. I did.

Mr. Riker: That is all, Doctor.

Redirect examination by Mr. O'Sullivan:

Q. Mr. Miller, were mud samples taken for any other form
1214 of examinations besides the chemical tests that you subject muds to?

—. They were. The muds were examined by the bacteriologists for the bacterial contents, the total bacterial contents, and to the presence of B. Coli communis, and in addition I recollect that Dr. Parsons made some examinations on those muds for their relative putrescibility.

Q. Which are not recorded in either Complainants' Exhibit No. 12, nor Complainants' Exhibit No. 14?

A. That not being part of my work I have not looked for it. They may be or they may not. Those examinations were not made by me. I am simply stating my recollection of work done in the laboratory by my co-laborers.

Q. Mr. Miller, were mud samples collected which were not subject to chemical tests, but were turned over to the bacteriologists for examination?

A. Yes.

Q. Mr. Riker asked if you did any of the actual plottings or drew any of the maps or charts. Are you a chemist or a cartographer?

A. I am a chemical engineer, not a draughtsman.

Q. Mr. Riker asked you about the color tests which you applied in the water samples which you examined. What standard did you use in making these color tests.

A. I used the Hazen-Platinum-Cobalt standard, which is a definite standard and is prescribed by the American Public Health Association. I think it is generally recognized both in this country and abroad as the most stable and reliable standard or reference.

Q. Did you use any other standard?

A. In my turbidity examinations I always used the silica standard as to which I may say the same that I did of the color standard as to its reliability and the extent to which it is recognized as being reliable.

Q. Are both of these standards recognized and prescribed by the American Public Health Association?

A. They are. They were at that time.

1215 Q. Mr. Riker asked some questions relative to a difference in a sample there between the laboratory color and the color noted on the Field Book, with regard to a mud sample. Will you state what you mean by the field color and by the laboratory color, and what relevancy either has to the other?

A. The field color of any mud sample in my opinion is not a

very important matter, and when a series of samples are being taken, it is not a fair color to report, that physical characteristic being expected to be taken in connection with the series. The color of the laboratory samples was always taken as a more definite and uniform basis. I think I have testified as to the manner in which the loss on ignition was obtained. That is from the sample, a weighed sample taken from the dried sample, a large quantity of the dried sample. Now, this dried sample was always of a uniform amount and dried at a uniform temperature for the same length of time in every case, so that the resulting color was considered of more importance than that of the wet sample as taken from the water. Mud is rarely of the same consistency as you find it in the bottom, and the percentage of water, even though the water may have no color of its own does have an apparent effect upon the color of a more or less wet sand.

Q. Is that one of the reasons——

A. Can I explain more fully what I mean?

Q. Yes, sir, explain fully, I wish to understand you.

A. And that is the reason, as near as I can explain it, for the apparent discrepancy between the field notes on that particular sample of mud to which attention was called, and the laboratory notation which corresponds with that in the exhibit. It is my intention and my impression and belief that the color as given from the laboratory notes and as it appears in the exhibit is a more true and comparable expression and description of that particular sample of mud as compared with all samples reported than whatever
1216 color may happen to be noted at the time of taking the sample in the field book.

Q. Is it or is it not the universal experience of chemists that the field color is darker than the laboratory color?

A. The field color is always darker than the laboratory color.

Q. And was that the way that it appeared when comparing the laboratory color from your laboratory note book with the color as described in your field note book?

A. That is the way it appeared.

Q. Mr. Riker examined you on your ignition test. Will you describe the technique employed in obtaining this loss on ignition?

A. In obtaining the loss on ignition of a sample of mud, such as we are in the habit of collecting, it was the practice of the laboratory to take a rather large quantity in the neighborhood as I remember, of 20 or 25 drams, perhaps more. Spread that out in a thin layer on one of the standard sized Petrie dishes, which are their stock article in the laboratory, and are used for bacterial work mostly. This initial sample of mud is spread out in one of the standard sized Petrie dishes in a thin layer, and dried in a hot air oven for exactly one hour.

Q. Do you recall about the temperature?

A. At a temperature not exceeding 105 and not allowed to drop below 100.

Q. 105 by what scale?

A. Centigrade. The ovens were always brought to that temperature, to the temperature of approximately 105, before the samples were inserted, and the samples were maintained for one hour, at closely to a temperature of 105 degrees Centigrade. They were then removed and cooled in a dessicator, which prevented them from absorbing atmospheric moisture, and the dishes were then removed, the contents pulverized to a certain extent with a glass or a porcelain pestle in the dish no particular force being used. This pulverizing simply being to disintegrate the mass or break up any cementation which might exist over the surface.

1217 Then from this dish samples were transferred to porcelain crucibles, previously dried and weighed. About one gram or a gram and a half of this mud sample—representative samples being taken from different parts of the dish, so as to insure as fair an average as possible—about one to one and one half grams were then actually weighed in the porcelain crucible. That is, the weight of the crucible being known, a fair sample was taken of dried mud and the second weight taken which gave the absolute weight of mud under examination. This crucible was then covered and brought up slowly to a low red heat, the object of using the cover being to avoid the mechanical loss which always occurs if you ignite anything of high organic contents too rapidly. As soon as the more volatile organic compound seems to be burned off, the cover is removed and ignition continued for an hour without the cover. The crucible with the contents was then cooled in the dessicator and weighed, the loss in weight calculated back to the amount taken and the results expressed as they appear in these exhibits, in parts per million by weight.

Q. What exhibits have you just referred to?

A. I am now referring to Complainants' Exhibit No. 14, which contains the work done by me on mud samples.

Q. Mr. Riker examined you relative to mouldy odors and to what you attributed the source or composition of the substance that gave that mouldy odor. Did you answer fully in that respect?

A. I believe I answered Mr. Riker to the effect that the mouldy odor was more or less recognized and understood by the majority of people. It is due to the action of yeast and bacteria on organic matter. Nearly every one has sometimes experienced the characteristic odor of a mouldy loaf of bread or decayed vegetable matter.

Q. Meaning yeast ferment?

A. The yeast ferment. The odors are distinctive. Frequently you can identify the actual species involved in the fermen-

1218 tation from the odor, and know what to look for under the microscope from the very odor.

Q. Do you recognize the regular yeast ferment by the name of sachromycetes cervicæ?

A. I do.

Q. In your answer to Mr. Riker, you stated that where mud samples gave mouldy odors, you regarded them as of vegetable organic origin?

A. I think I qualified that.

Q. You may qualify it now?

A. They are not necessarily of vegetable origin, or organic origin, the decomposition of organic matter, it may be from vegetable matter, from animal matter or from a combination.

Q. May it be from vegetable matter that had passed through the alimentary canal of an animal?

A. It would still be vegetable matter: it would not be a product of the animal: it would simply be in transit.

Q. Did you connect that mouldy odor with sewage, that is what I was trying to get at, Mr. Miller?

Mr. Riker: That is referring to that one sample.

Mr. O'Sullivan: Yes, sir, the one you examined him on.

The Witness: Referring to that one particular sample.

Mr. Riker: Yes.

The Witness: Will you tell me what number that was before I answer?

Mr. O'Sullivan: I withdraw my question.

Q. Not in any particular samples, but the mouldy odor that you have described to Mr. Riker as being detectible by your olfactory organs in mud samples that you subjected to that test?

Mr. Riker: I object to the question as not cross examination. My examination was directed to the mouldy odor of that particular sample.

The Commissioner: Note the objection.

A. I frequently did connect that mouldy odor with sewage contamination.

1219 Q. In your reference to the tabulations of water samples you testified from Complainants' Exhibit No. 12?

A. I did.

Q. And Complainants' Exhibit No. 12 has certain pages with the alignment inaccurate, according to your previous testimony?

A. Yes.

Q. And Complainants' Exhibit No. 19, contains the sheets wherein the alignment had been corrected, is that so?

A. That is true.

Q. I hand you a number of blue sheets of tabulations and ask if you find in that the complete analyses of water samples as made by you relating to numbers 1 to 931 from New York Bay and vicinity, and if you find that correct, the one I hand you is correct in every particular?

Mr. Riker: This is not redirect examination. I object to the question as not redirect examination, and not relevant to the examination had of this witness.

The Commissioner: Note the objection.

A. The volume of blue prints, blue print tabulations submitted to me, containing 23 pages, I have examined and compared with

Complainants' Exhibit No. 12, and Complainants' Exhibit No 19, and have found the errors in alignment which Exhibit No. 19 was intended to correct in No. 12 to have been embodied and corrected so that this present volume contains a correct transcript of the record as I find it in my own books and in the manuscript report submitted to the Metropolitan Commission, and the note books on file with them.

Q. The volume that I hand you?

A. I find the volume that you hand me correct, a correct record of all the work done in connection with the water.

Mr. O'Sullivan: I offer that. I ask Mr. Commissioner that that be marked Complainants' Exhibit No. 20. It is number 12 with the correct sheet in. If I was allowed to substitute them at the time, it would save this.

1220 Mr. Riker: I would like to ask a few questions on this offer.

Recross-examination by Mr. Riker:

Q. When did you see this particular volume so called, first?

A. Yesterday.

Q. Who gave it to you?

A. Dr. O'Sullivan.

Q. And what have you done in the line of verifying it with your original work?

A. I have checked the pages over.

Q. With what?

A. With my original reports with my laboratory notes.

Q. And these particular blue prints?

A. Those particular blue prints marked with my initials as I checked them.

Q. What else did you do with them?

A. Turned them over to Dr. O'Sullivan.

Q. And you compared them?

A. Compared them with the copies of the record of the exhibit previously submitted and with my notes and the notes that I had made of the errors in alignment. The errors in alignment I find to have been corrected and it corresponds and is a true record of the work done, of the work testified to by me.

Q. Did you compare them the entries with your original field entries?

A. The entries in complainants' Exhibit No. 12 and 19, as I have already testified, were compared with the originals, the original field records and this volume also I have testified was compared with the original field entries.

Q. Yes, sir.

A. And the errors in alignment were noted and mentioned, which called for the introduction of Exhibit No. 19. Now this report I compared with the original exhibits 12 and 19, and I find that the errors to which I have drawn attention have been corrected in the volume offered.

Q. Perhaps I misunderstood you to say that you had compared this volume which is now offered to be marked with your original laboratory notes?

1221

A. With the original and these both.

Q. Then I asked you whether you had compared this volume which is now offered with your original entries in your field note books?

A. I did with those note books which are in my custody and from which I obtained the figures.

Q. I ask you now whether you compared them with the field books, the entries in the field books made by you?

A. Yes.

Q. When did you do that?

A. Yesterday.

Q. Have you the books here that you made your comparisons with?

A. Here is the book (Witness produces book.) Continuing: Of the water samples, and this is the mud book (indicating).

Mr. O'Sullivan: One moment. What book have you just handed to counsel for the defense?

The Witness: I am referring to a field book kept while I was chemist for the Metropolitan Sewerage Commission which contains all the figures all the tabulated data in regard to the chemical determination made by me. In addition to that it contains subsequent analyses made for other people and so on.

Q. Is that your own private laboratory note book?

A. My own private property, my own private laboratory book.

Q. Then you have before you, Doctor, as I understand you the original books of entry of your memoranda which served as the standard for the offer that was made?

A. That I always relied on.

Mr. Riker: I object to the offer on the ground that the witness now has before him the original memoranda and they are the best evidence and ought to be introduced.

Mr. O'Sullivan: The evidence insisted upon by Counsel for the defense is unintelligible to anybody but an expert chemist. They are the condensed notes made in a laboratory by the gentleman who has produced them, in the field, and the completed work

1222

appears in the tabulations which he has identified as a correct report of the work which he did on the samples enumerated therein, and to which he has testified.

Mr. Riker: I further object on the ground that the papers at best can only be used for the purpose of refreshing his memory, as being memoranda made at the time and that the only proper memoranda for the purpose of refreshing the memory of the witness are the original memoranda, and those are before the witness and should be used by him.

The Commissioner: Note the objection of counsel for the defendants.

The Exhibit will be marked Complainants' Exhibit No. 20.

Marked Complainants' Exhibit No. 20.

Recross-examination by Mr. Riker:

Q. What different physical condition in your judgment is indicated by a smaple of mud whose color is light brown from one whose color is dark brown?

Mr. O'Sullivan: I object on the ground that this has been completely covered on the cross examination, rather exhaustively gone into.

The Commissioner: Note the objection of counsel for the Complainants.

A. That would depend on a great many factors. It would depend on the composition of the mud.

Q. Take in itself, what importance would you attach to the difference between a light brown and a drak brown color in the appearance of a mud sample?

A. Of a dry mud sample.

Q. A light brown and a dark brown?

A. In a mud sample?

Q. Yes.

A. Dry or wet?

Q. Yes, dry or wet.

A. If the sample were wet, I would attach less importance to it than if it were dry.

1223 Q. Have you examined the original field notes as to the colors of samples of mud with the laboratory determinations of the samples of mud?

A. Not very extensively.

Q. Do you know whether the field notes show in any considerable number of instances a difference in color?

A. I do not know how many differences they show. I reported on my laboratory notes.

Mr. O'Sullivan: And your laboratory notes are here now?

The Witness: My laboratory notes are here. My manuscript reports to the commission are here.

Mr. Riker: The field notes are not in evidence.

The Witness: The field notes are here.

Mr. Riker: They are not in evidence.

Mr. O'Sullivan: Counsel for the complainants wishes it to appear of record that the field notes and the report produced here by the Metropolitan Sewerage Commission are public documents which counsel for complainants has been instructed not to put in evidence, and which counsel for defendants has just stated have only been used to refresh the memory of those who have made them in testifying. Are you through Mr. Riker?

Mr. Riker: Yes.

ANDREW J. PROVOST, JR., a witness called on behalf of the Complainants recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. When you were on the stand last Mr. Provost, you testified in relation to float observations?

A. I did.

Q. Did you cover that entire subject or is there anything that I have omitted on that point?

A. I covered it at that time with respect to the travel of the floats, but not with respect to the tidal and wind conditions which existed at the time the observations were taken.

Q. Will you supplement that?

1224 A. I will add to my testimony at that time by stating the time of high water as observed at the nearest gauge, and also as to the direction, the observed direction and velocity of the wind during the time the float observations were made.

Mr. Riker: I would like to ask, the witness is using some memoranda, and I would like to ask him what they are?

The Witness: These memoranda which I have before me are my own notes.

Cross-examination by Mr. Riker:

Q. Made when?

A. Made at various times in the study of this work. The data on the tidal currents was not personally observed by the Metropolitan Sewerage Commission during 1907, for the reason that it was considered unnecessary to duplicate the observations, the extensive observations that were being made at that time by the Department of Docks and Ferries, and the records on that matter are public.

Q. These memoranda you have are excerpts from records that have been made by somebody?

A. They represent memoranda made by me from an examination of the authentic chart preserved by the Department of Docks and Ferries of the City of New York, from their various tidal stations within the harbor and adjacent waters during the year 1907.

Q. And do your memoranda cover anything else?

A. My memoranda also cover the meteorological data relating to the direction and velocity of the winds in the vicinity of New York City during the days and hours when the float observations were under way.

Q. Is the memoranda, original memoranda, taken by you at the time of the observations?

A. The data which I have is a transcript made by me from the records of the Meteorological Bureau of the department of parks of the City of New York.

Mr. Riker: I object to the witness using this memoranda, as they do not appear to be originals made by himself and appear to be merely his notations upon the original records which are
1225 the best evidence and should be produced.

The Witness: The meteorological records have been introduced here as an exhibit.

Mr. O'Sullivan: Counsel for complainants offers Complainants' Exhibit No. 13 for the use and benefit of defendants' counsel. This deals with the report of the New York Meteorological Observatory of the Department of Parks for the year 1907.

Redirect examination by Mr. O'Sullivan:

Q. You may proceed?

A. The Meteorological records which I have noted here are taken from the exhibit that you have just referred to. In regard to the float observation No. 1 made on February 23rd, 1907, from 7 A. M. to 5:45 P. M. the time of high water at the nearest gauge, Pier A., Battery, was from 3:30 to 5:15 A. M. The direction of the wind during this period is recorded as varying between northwest to north, northwest, its velocity from six to twelve miles per hour, with an average for the entire period of 9.4 miles per hour. The float observation to which I have just referred shown on Complainants' Exhibit No. 4, Sheet No. 1, as green lines and figures.

Reference to Float observation No. 2, taken on February 25th, 1907, between the hours of 10:15 A. M. and 6 P. M. that shows that the high water at the nearest gauge, Pier A, North River, from 7 to 8 A. M. That the direction of the wind during this period varied from west, northwest to northwest. That is west, northwest, to northwest. That the velocity of the wind during this period varied from 16 to 21 miles per hour with an average velocity of 17.8 per hour during the entire period.

The float observation to which this corresponds is shown on Complainants' Exhibit No. 4, sheet No. 1 in red lines and figures.

With reference to the third observation made on February 26th, 1907, between the hours of 10 A. M. and 5.40 P. M. the record shows that the time of high water at the nearest gauge Pier A North River was from 7 to 7:45 A. M. That the wind direction varied during this period from north, northwest, to east to southeast. That the wind velocity was from 1 to 6 miles per hour, with an average velocity of three miles per hour during the entire period.

The float observation to which I have referred is shown on Complainants' Exhibit No. 4, Sheet No. 1 in yellow lines and figures.

With reference to float observation, recorded on Complainants' Exhibit No. 5, Sheet No. 2 as Observation No. 4, March 4, 1907, shown on that chart in yellow lines and figures, the record shows at the time of high water at the nearest gauge at Grand Street, East River was at 12:30 A. M. That the direction of the wind during the period when the observation was made was from north to northwest, that the velocity of the wind during the period was from 6 to 10 miles per hour, with an average velocity of 8.6 miles per hour, during the entire period.

Float observation Nov. 5, shown on Complainants' Exhibit No. 5, Sheet No. 2 under date of March 5th, 1907, shown in red lines

and figures, as occurring between the hours of 8 A. M. and 5:30 P. M. In respect to this observation the record shows that the time of high water at the nearest tide gauge, West 23rd Street, was 12:30 P. M. that the direction of the wind during this period was from west, northwest to south to southeast. That the wind velocity was from 1 to 8 miles per hour, the average wind velocity 3.4 miles per hour, during the entire period.

In respect to float observation of March 7th, 1907, shown on Complainants' Exhibit No. 5, Sheet 2 in green lines and figures as occurring from 10:25 A. M. to 3.45 P. M. the record shows that

1227 the time of high water at the nearest tide *grade,* Astoria, was 3:45 to 4:30 P. M. That the direction of the wind during this period was from east to north to northwest to southeast. That the wind velocity varied from 1 to 7 miles per hour, with an average velocity of 3½ miles per hour during the entire period.

With respect to float observation on March 22nd, 1907, being the 7th observation shown on Complainants' Exhibit No. 5, Sheet No. 2, in blue or purple lines and figures and occurring from 11 A. M. to 4 P. M. the record shows that the time of high water at the nearest tide gauge 47th Street Brooklyn was from 2 to 3 P. M. That the wind direction varied from west, southeast to west, and that the wind velocity was between 8 and 10 miles per hour, averaging 8.8 miles per hour during the entire period.

With respect to float observation on March 23rd, 1907, observation No. 8, shown on Complainants' Exhibit No. 6, page 3, in blue or purple lines and figures, and occurring from 1 to 5 P. M. the record shows that the time of high water at the nearest tide gauge, 47th Street, Brooklyn, was between 3 and 4 P. M. The direction of the wind varied from north to north, northeast, and its velocity from 7 to 9 miles per hour, averaging 8 miles per hour during the entire period.

With respect to the float observations of March 25th, 1907, being observation No. 9 shown on Complainants' Exhibit No. 6, page 3, in red lines and figures, and occurring between 9:30 A. M. and 4:45 P. M. the record shows the time of high water at the nearest gauge, Pier A North River was from 3:30 to 5 A. M. That the direction of the wind varied from east to south and its velocity from 2 to 13 miles per hour, averaging 7 miles per hour, during the entire period.

With respect to float observation of March 27, 1907, which observation is No. 10, shown on Complainants' Exhibit No. 6, Page

1228 3, in green lines and figures, and occurring from 9:30 A. M. to 3 P. M. the record shows *at* the time of high water at the nearest tide gauge, Pier A, North River was from 6:15 to 7:15 A. M. That the direction of the wind varied from east, northeast to east to southeast and its velocity from 1 to 2 miles per hour, averaging 1.8 miles per hour during the entire period.

With respect to float observation of March 28, 1907, being observation No. 11, shown on Complainants' Exhibit No. 6, Sheet 3 in yellow lines and figures, and as occurring between 11 A. M.

and 3:30 P. M. the record shows that the time of high water at the nearest tide gauge, 47th Street, Brooklyn, was from 6:15 to 7:15 A. M. That the direction of the wind varied from east to west, southwest, and its velocity from 1 to 4 miles per hour, averaging 2.6 miles per hour during the entire period.

With respect to float observation of March 29, 1907, being observation No. 12, shown on Complainants' Exhibit No. 7, Sheet 4 in red lines and figures, and as occurring between 10 A. M. and 4:45 P. M. the record shows that the time of high water at the nearest gauge, Astoria, was from 9:30 to 10 A. M. That the direction of the wind was from east to south, southeast, and its velocity from 2 to 5 miles per hour, averaging 3.6 miles per hour.

With respect to observation of April 2, 1907, being observation No. 13, shown on Complainants' Exhibit No. 7, Sheet 4, in green lines and figures as occurring between 1:20 P. M. and 6:20 P. M. the record shows *at* the time of high water at the nearest gauge Spuyten Duyvil, was from 12 Noon to 1 P. M. The time of law water at the nearest gauge, Pier A, North River, was from 5 to 6 P. M. That the direction of the wind was from north, northeast to northeast and the velocity was from 5 to 15 miles per hour, averaging 10 miles per hour during the entire period.

1229 With respect to float observation of April 3rd, 1907, being observation No. 14, shown on Complainants' Exhibit No. 7, page 4, in yellow lines and figures, occurring from 12:45 P. M. to 6:10 P. M. the record shows that the time of high water at the nearest gauge, Mariner's Harbor, Staten Island, 11 A. M. to 12 Noon. That the time of low water at the nearest gauge 47th Street, Brooklyn was from 5:30 to 6 P. M. That the direction of the wind was from west to south, southeast and its velocity from 1 to 7 miles per hour averaging 3.2 miles per hour, during the entire period.

With respect to float observation of April 4th, 1907, being observation No. 15, shown on Complainants' Exhibit No. 7, Page 4, in blue or purple lines and figures as occurring from 9 A. M. to 1:35 P. M. the record shows *at* the time of high water at the nearest gauge 47th Street Brooklyn was from 12:30 to 1:15 P. M. That the direction of the wind was from southeast to south and its velocity from 2 to 6 miles per hour, averaging 4.4 miles per hour during the entire period.

With respect to float observation of April 5th, 1907, being observation No. 16, shown on Complainants' Exhibit No. 8, page 5, in green lines and figures, and as occurring from 9:30 A. M. to 5:10 P. M. the record shows *at* the time of high water *that* the nearest gauge, Pier A North River was from 1:30 to 3 A. M. and the time of low water at the nearest gauge 47th Street, Brooklyn was from 9 to 9:30 A. M. That the direction of the wind was from north, northeast to east and its velocity was from 2 to 15 miles per hour, averaging 9 miles per hour during the entire period.

With respect to float observation of April 8th, 1907, being observation No. 17, shown on Complainants' Exhibit No. 8, Page 5, in red lines and figures, and as occurring from 11:30 A. M. to

5:30 P. M. the record shows that the time of low water at the nearest gauge, Mariner's Harbor, Staten Island, was from 11:45 A. M. to 12:15 P. M. The time of high water at the nearest
1230 gauge, Mariner's Harbor, Staten Island, was from 5 to 6 P. M. That the direction of the wind was from northeast to north and its velocity from 4 to 8 miles per hour, averaging six miles per hour during the entire period.

With respect to the float observation of April 12th, 1907, being observation No. 18, shown on Complainants' Exhibit No. 8, Page 5, in yellow lines and figures, and as occurring from 9 A. M. to 6 P. M. the record shows that the time of high water at the nearest gauge, Pier A North River was from 8 to 9 A. M. The time of low water at the nearest gauge 47th Street Brooklyn was from 2 to 3 P. M. That the direction of the wind varied from east, northeast to south, and its velocity from one to four miles an hour, averaging 2.8 miles per hour during the entire period.

With respect to the float observation of April 13th, 1907, being observation No. 19, shown on Complainants' Exhibit No. 8, Page 5, in blue or purple lines and figures, the record shows that the time of high water at the nearest gauge 47th Street Brooklyn —from 8:15 to 9:15 A. M. That the direction of the wind was from north, northwest to north. Its velocity from 3 to 7 miles per hour averaging 4.7 miles per hour during the entire period.

With respect to the float observation of June 26, 1907, being observation No. 20, shown on Complainants' Exhibit No. 9, Page 6, in green lines and figures, and as occurring from 11:10 A. M. to 2:30 P. M. the record shows that the time of high water at the nearest guage, 47th Street Brooklyn—between 6:30 and 7:30 A. M. The direction of the wind was from west to south, southwest to east, and its velocity from 1 to 10 miles per hour, averaging 5 miles per hour during the entire period.

With respect to the float observation of July 8th, 1907, being observation No. 21, shown on Complainants' Exhibit No. 9, Page 6, in red lines and figures, and as occurring between 10:10
1231 A. M. and 4:45 P. M. the record shows the time of high water at the nearest guage, 7:30 A. M. and 7:30 P. M. The direction of the wind varied from north, northwest to west, southwest, and its velocity from 3 to 8 miles per hour, averaging 5.6 miles per hour during the entire period.

With respect to float observation of July 9th, 1907, being observation No. 22, shown on Complainants' Exhibit No. 10, Page 7, in red lines and figures, and as occurring between 10:30 — and 5 P. M. the record shows the time of high water at the nearest gauge being 7:30 A. M. and 8 P. M. The direction of the wind throughout the period was northwest and the velocity 9 to 17 miles per hour, an average of 13.1 miles per hour during the entire period.

With respect to float observation of July 11th, 1907, being observation No. 23, shown on Complainants' Exhibit No. 10, Page 7, in green lines and figures, the record shows that the time of high water at the nearest gauge Spuyten Duyvil was from 10 to 11 A. M.

That the direction of the wind was east, northeast to east and the velocity from 4 to 8 miles per hour, averaging 6.4 per hour during the entire period.

With respect to float observation of July 16th, 1907, being observation No. 24, shown on Complainants' Exhibit No. 10, Page 7, in yellow lines and figures, as occurring from 10:15 A. M. to 1:30 P. M. the record shows the time of high water at the nearest gauge, Pier A, North River from 11:45 A. M. to 1 P. M. The direction of the wind was from south, southeast to south, and its velocity from 4 to 7 miles per hour, averaging 5.8 miles per hour, during the entire period.

With respect to the observation of July 17th, 1907, being observation No. 25, shown on Complainants' Exhibit No. 11, Page 8, in red lines and figures, the record shows the time of high water at the nearest gauge, West 23rd Street Manhattan, 1:30 to 2:30 P. M. and the time of low water at the nearest gauge, Pier A North River between 7 A. M. and 8 P. M. The direction of the
1232 wind was southwest to west, and its velocity from 8 to 10 miles per hour, averaging 9 miles per hour during the entire period.

The float observations of July 19th, 1907, being observation No. 26, shown on Complainants' Exhibit No. 11, Page 8, in green lines and figures, the record shows the time of high water at the nearest guage, Spuyten Duyvil was 3:15 to 4 A. M. The time of low water at the nearest gauge, west 23rd Street, Manhattan was 9:30 to 10 A. M. The direction of the wind was from north to north, northeast and the velocity from 3 to 9 miles per hour, averaging 5.3 miles per hour during the entire period.

With reference to float observation of July 22nd, 1907, being observation No. 27, shown on Complainants' Exhibit No. 11, Page 8, in yellow lines and figures, the record shows the time of high water at the nearest gauge, Spuyten Duyvil from 6:30 to 7:15 A. M. The time of low water at the nearest gauge Spuyten Duyvil was from 12:30 to 1:15 P. M. The direction of the wind from east, northeast to east, southeast to west. This velocity varied from 1 to 6 miles per hour; average 3.8 miles per hour during the entire period.

Q. Mr. Provost, have you read the testimony that you gave when you were on the stand previously?

A. I have.

Q. Have you found that it needed any correcting or were any corrections needed to be made?

A. I found a few printers' errors I would like to call attention to. I do not know that they are serious at all. They appear in Volume 3, No. 2, on page 772 in the tenth line the word "sewer"——

Q. The tenth line from the top?

A. The tenth line from the top the word "sewer" should be "several". In the same page the 20th line, it refers to the Department of Laws, that should be the Law Department of the City of New York. On the next page 773, the 27th line the word "likely" should be "local". Page 775 the fifth line, the name William H. Clark,

should read "William H. Park". Page 806, the seventeenth
1233 line the word "I" should read "were". That is all I found.

Adjourned to December 28, 1911, at 10:30 A .M.

1234 Supreme Court of the United States, October Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK CITY,
December 28th, 1911, 10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances:

Dr. William J. O'Sullivan, Special Counsel for the People of the State of New York.
Adrian Riker, Esq., of Counsel for the Passaic Valley Sewerage Commission.
Joseph Coult, Esq., of Counsel for the Passaic Valley Sewerage Commission.

Met pursuant to adjournment.

Mr. O'Sullivan: Take the stand, Mr. Provost.

ANDREW J. PROVOST, JR., a witness called on behalf of Complainants, recalled for further examination, testified as follows:

Direct examination (continued) by Mr. O'Sullivan:

Q. Mr. Provost have you in your previous testimony that you recall, dealt with the area of a float that was exposed to the wind, the area that was exposed to the water?

A Only in a general way. I stated as I remember, the approxi-
mate submerged area of the float, stating, as I recall it, that
1235 the float was submerged about five or six feet below the surface of the water. That it was composed of two metal vanes, set at right angles to each other, with cross sections of three or four feet, square feet. That these vanes were attached to the bottom of a pole made of wood about 2 inches in area and about 6 feet long. That the float was adjusted as to weight so that the top of the pole when the float was in the water would be just above the surface of the water, perhaps an inch or two. From the top of this pole, there was carried a short flag rod, perhaps half an inch in diameter and a foot or 18 inches high. At the top of that there was a small flag to allow the float to be distinguished when it was in the water from some little distance. The submerged area of the float

was relatively greater than the area of the float appearing outside of the water. Approximately there would be several square feet of area exposed to the influence of the water, and a few square inches exposed to the air

Q. Did you have any particular object in that arrangement in minimizing the exposed area to the wind and increasing the exposed area to the influence of the water currents?

A. Yes, the object was to secure as accurate as possible a true representation of the direction and velocity of the water currents, which influenced the travel of the float, as opposed to any influence that might be exerted on the float by the wind influence.

Q. Is there anything in regard to these float observations that I have failed to elicit by my questions that you recall, and which you would wish to add?

A. I do not recall anything that I wish to say at this time.

Q. Now, about the sampling of the waters, is there anything you wish to add to your testimony on that?

A. As I recall the testimony in a general way, that there were about 900 samples of water collected and analyzed during 1907.

1236 This might be amplified by stating that the work was commenced in January, 1907, and during that month 47 samples of water were collected chiefly in the vicinity of the 49th Street sewer outlet in Brooklyn, and extending from there into Gowanus Bay. During the month of February 118 samples of water were collected and analyzed in the upper Bay, the North River and Gowanus Canal, and the Kill von Kull. During the month of March there were 88 samples of water collected and analyzed from the Upper Bay, the East River the Kill von Kull and the North River.

During the month of April, there were 194 samples of water collected for analysis, chiefly in the Upper Bay and the North River.

During the month of May there were 7 samples of water collected for analysis, chiefly in the Harlem River and East River and in Newtown Creek.

During the month of June there were 83 samples of water collected, chiefly in the Upper Bay, East River and the Harlem River.

During the month of July there were 66 samples of water collected for analysis in the Hudson River.

During the month of August, there were 66 samples of water collected for analysis from the Buttermilk Channel, Gowanus Bay, the Narrows, the Lower Bay and the East River.

During the month of September, there were collected 188 samples of water for analysis from the Lower Bay, Gowanus Bay, Gowanus Canal and Kill von Kull. The Upper Bay, the Harlem River, the Narrows, Newtown Creek, the North River and Newark Bay.

During the month of October, there were 74 samples of water collected for analysis from Gowanus Canal and Bay, Newtown Creek and the East River.

1237 During many of the same months samples of mud were collected from the bottom of the bay and the adjacent tributary waters and as I recall it, I testified there were about 700 sam-

ples taken in all during the year 1907. This work was commenced in February.

Q. The mud?

A. The mud sampling and during the month *the month* of February there were 27 samples collected for analysis from the bottom in the Upper Bay in the Gowanus Bay, Gowanus Canal and from the Lower Bay.

During the month of March there were collected 122 samples of muds in the East River, in the Upper Bay and in the Kill von Kull.

During April there were collected 165 samples of mud in the Upper Bay, Gowanus Bay, Gravesend Bay, the Kill von Kull and the North River.

During the month of May there were 126 samples of mud collected from the Spuyten Duyvil, Harlem River, the Upper Bay, Gravesend Bay, Coney Island Creek, Erie Basin and the East River.

During the month of June there were collected 62 samples of mud in the North River, Erie Basin, Gowanus Bay, the Upper Bay, the Narrows, East River, Newtown Creek, Wallabout Bay, Spuyten Duyvil Creek and the Harlem River.

During the month of July there were 117 samples of muds collected in the Upper Bay, the Narrows, the Lower Bay, the North River, East River, Buttermilk Channel and the Narrows.

During the month of August there were collected 20 samples of mud in the Ambrose Channel.

During the month of September there were collected 45 samples of mud in the Wallabout Bay, the Atlantic Basin, Erie Basin, Coney Island Creek, Gravesend Bay, Gowanus Bay, Gowanus Canal, Kill von Kull, Harlem River, Narrows, Newtown Creek, Newark Bay, Passiac River, North River and in Central Park Reservoir.

1238 During the month of October there were 21 samples of mud collected in Gowanus Canal, Gowanus Bay, and in the Upper Bay. Those included the general locations of all samples taken during this period.

Q. Now, did you hear Mr. Merritt testify as to the plottings on the map or tracings from which those blue prints were made?

A. The prints of the stations showing where the samples were taken?

Q. Yes.

A. I did.

Q. I hand you Complainants' Exhibit No. 18, sheets 1 to 16, and ask if those were the stations that you have just testified to that were plotted on the sheets?

Mr. Riker: Before he uses the exhibits for that purpose, I would like to make some inquiries.

Mr. O'Sullivan: All right.

Cross-examination by Mr. Riker:

Q. Were you present when the samples were taken?

A. I may have been when some were taken, not all by any means.

Q. Do you know of your own knowledge at this time where any of the samples were taken?

A. I could not state at this time from memory where they were taken.

Mr. Riker: I object to the use of the exhibit by this witness for any purpose when he does not remember where the samples were actually taken and has no knowledge of it.

The Commissioner: Note the objection.

The Witness: These 16 sheets of blue prints which I have before me and which are marked Complainants' Exhibit No. 18, Sheets 1 to 16, show the locations of the sampling stations, which were occupied during 1907, for the taking of samples of both muds and waters and which I have testified to in a more general way.

1239 Redirect examination by Mr. O'Sullivan:

Q. Mr. Provost, did you prepare an index of these stations showing the chart locations of samples taken at each station during 1907?

A. I did.

Q. Have you got such an index with you?

A. I have the index before me.

Q. Who prepared that index?

A. It was prepared from notes from my own work, under my supervision and direction.

Q. Do you know whether or not that index is accurate?

A. I have verified its accuracy in a great many particulars; I believe it to be correct.

Mr. O'Sullivan: I offer that in evidence and ask that *that* it be marked Complainants' Exhibit No. 21.

Mr. Riker: I would like to ask a few questions on the offer.

Recross-examination by Mr. Riker:

Q. That is a blue print, is it not, that you have before you?

A. It is a blue print.

Q. Have you compared that blue print with any original memoranda?

A. It is not necessary to compare this, I compared the tracing from which this was made.

Q. I asked you whether you had compared the blue print with the original memoranda you had made?

A. I have not. I did not consider it necessary.

Q. Well, your comments are not necessary. Did you prepare the original index?

A. Yes, sir, I did.

Q. I thought you answered your counsel that it was prepared under your supervision?

A. I prepared the index myself. I prepared the index myself.

Q. What did you prepare it from?

A. I prepared it from the field note books, from the daily reports that were made to me from the technical staff and from charts that were made from time to time from note books showing the locations of the stations.

1240 Q. You prepared it then from data which was furnished to you, and which you did not yourself make?

A. On data that I had in my possession.

Q. I asked you whether you prepared from data furnished you and not from data which you yourself secured.

A. Prepared from data that was furnished to me.

Mr. Riker: I object on the ground that it has no probative value and is not a proper exhibit in the cause. That it appears to be simply this man's work on data which he does not know to be true.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 21.

Marked Complainants' Exhibit No. 21.

Redirect examination by Mr. O'Sullivan:

Q. How frequently did the chemist, bacteriologist and engineer in charge of the securing of these mud and water samples, report to you?

Mr. Riker: I object to it on the ground that it is immaterial, how often they reported to him.

The Commissioner: Note the objection.

A. I received daily reports from them.

Q. And this Complainants' Exhibit No. 21 is simply an index to the plottings done by the Engineer, and to which he testified previously, in this case?

A. As shown on the 16 blue print charts.

Q. Have my questions elicited everything you wish to testify to regarding the locations of these mud and water stations?

A. I think so.

Q. Do the stations as plotted on Complainants' Exhibit No. 18 present a single sample from each station, or do they present many samples of both water and mud taken at the same stations?

A. Some of them represent a single sample taken at a particular station, and some of them were occupied many times and

1241 numerous samples of both water and mud were taken at the same station.

Q. Does that entail, Mr. Provost, a separate set of numbering for the samples and a separate set of serial numbers for the stations?

A. It does entail that.

Q. And does this Exhibit, Complainants' Exhibit No. 21, aid in locating both the stations and the serial numbers of the samples?

A. It does. It is prepared for the purpose of having ready access to the record and to the charts, showing just what was done at each particular point, which was occupied for the purpose of taking samples. And it also offers a reference to the other tables which

have been put in evidence here, giving the results of the analytical work done on the samples.

Q. I hand you Complainants' Exhibit No. 17, Mr. Provost, and ask to what does that relate.

Mr. Riker: I object to the question as the exhibit shows of itself what it relates to, otherwise it would not have been offered or admitted.

The Witness: This document I have before me marked Complainants' Exhibit No. 17, was prepared by me as an index to station locations shown on a separate series of charts prepared by me from data which was not susceptible of any duplication. Do you wish me to explain the reason for it?

Q. Yes.

A. At the time I was requested to furnish this information I had in my possession a blue print such as is before me now in Exhibit No. 18. That blue print could not be duplicated and the stations—the information shown on those blue print sheets was transferred very laboriously by hand upon Government charts, those charts forming the original basis of maps from which Exhibit No. 18 was prepared. Each station had to be plotted by hand and carefully checked up for the location, involving a great deal
1242 of work. At the time that I was a witness before in this case, in November, I think, I testified with regard to this Exhibit No. 17, with reference to these charts which I have before me now.

Q. And which are not in evidence?

A. And which were not put in evidence, because, at the time when they were about to be put in evidence, the original tracings were produced and it was found possible to obtain blue prints from those tracings which was deemed more desirable than the cardboard charts which you have before you made by the United States Government, which had the information added by me. That was not presented at that time for that reason. This exhibit No. 17 referred only to that series of charts which you have before you, nothing else.

Q. And which have not been offered in evidence?

A. And which have not been offered in evidence up to the present time.

Mr. O'Sullivan: Will you oppose my withdrawing this index? It is nothing but an index. Either that, or I will have to offer the maps, just as you say.

Mr. Riker: I do not think the commissioner would have any right to withdraw an exhibit, even if I do consent to it.

Mr. O'Sullivan: All right.

Q. I hand you the charts that you have just indicated and ask you to describe these charts and state who prepared them?

A. I have before me charts A, B, C, D, E, F and G, of plates of the United States Coast and Geodetic Survey showing New York

Harbor and adjacent waters. On these charts there have been plotted in red lines and figures——

Mr. Riker: Before testifying on what is in them, I say you ought to offer them at least. I object to the testimony of the witness on the ground that he cannot quote the contents of the paper in evidence until you have offered the paper.

1243 Mr. O'Sullivan: I press my question for the reason that the witness is just describing it for the purpose of the record, the things that I intend to offer as exhibits.

The Commissioner: Note the objection of counsel.

A. The stations which I have testified to as appearing on No. 18. Chart A, designated New York Bay and Harbor Polyconic projection, published by the Coast and Geodetic Survey.

Mr. O'Sullivan: I think I had better offer these as separate exhibits, instead of the series. I offer Chart A in evidence and ask that it be marked Complainants' Exhibit No. 22.

Mr. Riker: I would like to ask a few questions of the witness.

Recross-examination by Mr. Riker:

Q. The paper which is marked Chart A, and the title of which you have given, has had some additions made to it since you received it from the publisher, has it not?

A. As I testified.

Q. Who made the additions?

A. They were made at my office under my direction and supervision.

Q. When did you get this plate?

A. About September, 1911.

Q. Where did you get it?

A. I purchased it from one of the two agencies in this city where these charts are kept on public sale.

Q. You do not remember which? The two agencies are Negus on Water Street and Manning Yacht Agency. Which one of the two it was I do not remember. I had some trouble in getting it at one of them and had to get it from the other. Which one I cannot recall. I have records which would show it.

Q. Now, the additions to the plate which you yourself have put, as I understand, that you yourself noted on it?

A. Under my supervision and direction, I did not draw them.

Q. Where were they drawn?

A. Drawn in my office.

1244 Q. By whom?

A. By one of my draughtsmen.

Q. The additions are indicated or put on in different colored inks?

A. Different colored inks.

Q. Where did you get the data, the originals from which these additions to the plate were made under your supervision?

A. They were taken from a set of blue print sheets 1 to 16, taken

from the original tracings showing the sampling station locations in 1907.

Q. Are those blue prints already offered in evidence here?

A. A similar set.

Mr. Riker: I object to the offer on the ground that it is only a copy of a copy and merely cumulative in any event.

The Commissioner: Note the objection.

Mr. O'Sullivan: Complainants' Counsel presses his offer for the reason that Complainants' Counsel requested the consent of Defendants' Counsel to withdraw an Exhibit No. 17 which related, as an index, to this exhibit, and which, to make the record intelligible, obligates Complainants' Counsel putting in evidence that to which Exhibit No. 17 relates. I ask that it be marked Complainants' Exhibit No. 22.

The Commissioner: Received and marked Complainants' Exhibit No. 22.

Marked Complainants' Exhibit No. 22.

Q. Did you have any other charts prepared showing the plottings of these mud and water sampling stations?

A. I did. I have before me another chart, marked Chart B, published by the United States Coast and Geodetic survey, marked New York Harbor, Upper Bay and Narrows, anchorage chart to which have been added certain lines and figures referring to the location of the sampling stations occupying the territory covered by this chart.

Q. What additional matter was put on that chart after you received it from the agency of the Federal Government?

A. The sampling station locations were all plotted on this
1245 chart and then a series of squares of sections was added in order that the index which was prepared to cover these stations might refer to the same sheets as the original 16 sheets which the data were taken from.

Q. Where was that prepared?

A. Prepared in my office under my direction and supervision.

Mr. O'Sullivan: I offer that in evidence and ask that it be marked Complainants' Exhibit No. 23.

The Commissioner: Received and marked Complainants' Exhibit No. 23.

Marked Complainants' Exhibit No. 23.

Recross-examination by Mr. Riker:

Q. Where was the data which you have put on there obtained?

A. Obtained from the same set of blue prints.

Q. Already in evidence in this cause?

A. Taken from the data that that was, yes.

Q. Taken from the same data and of what did that data consist?

A. That data consisted of the original tracings, prepared by Mr. Merritt of these station locations.

Q. And this then is a reproduction to a certain extent of the original which was before you?

A. Yes.

Mr. O'Sullivan: State to what extent?

The Witness: It is a reproduction to the extent that it is the same sampling stations and numbers on it, as appear on the original tracings.

Mr. Riker: I object to the offer. The same objection to this offer as to the last.

The Commissioner: Note the objection.

Redirect examination by Mr. O'Sullivan:

Q. Did you have any other chart prepared showing the locations of these sampling stations for mud and water samples?

A. I did. I have one before me, Chart C, from the plates of the United States Coast and Geodetic Survey, marked Hudson and East River from West 67th Street to Blackwell's Island, New
1246 York.

Q. After you received that chart did you cause any added matter to be put thereon?

A. I did. I caused the sampling stations to be plotted on this chart, the locations shown in the original drawings of the sampling stations.

Q. Where was that done?

A. That was done in my office under my direction and supervision.

Q. Have you compared the work as it was completed in your office under your direction with the original data and verified it?

A. I verified it in very many particulars.

Mr. O'Sullivan: I now offer Chart C in evidence and ask that it be marked Complainants' Exhibit No. 24.

Recross-examination by Mr. Riker:

Q. Mr. Provost, was a blue print of the original from which you got the sampling stations the place on this chart, offered in evidence in this cause?

A. A similar blue print was offered in evidence. One from the same tracings was offered in evidence here.

Q. Which is simply a compilation made by you from one of these blue prints, or from the original tracings of which a blue print is now offered?

A. Made from the original tracings.

Mr. Riker: I object to the offer on the ground that one legal wrong does not cure another legal wrong, and also on the grounds already stated.

The Commissioner: Note the objection.

Mr. O'Sullivan: Complainants' Counsel desires to take exception

to the reference made to any legal wrong, as none have so far been perpetrated in this cause by complainants.

Received and marked Complainants' Exhibit No. 24.

Marked Complainants' Exhibit No. 24.

Redirect examination by Mr. O'Sullivan:

Q. Did you cause other charts to be prepared showing the
1247 plottings of the locations of the sampling stations for both mud and water?

A. I did. I have one before me, Chart D, on the plates of the Coast and Geodetic Survey marked Hell Gate and East River from Blackwell's Island to Lawrence Point, including to little Hell Gate, and to the mouth of the Harlem River. On this chart, I caused to be shown the locations of the various sampling stations shown on Exhibit No. 18, which lie within the territory covered by this chart.

Q. And to which Complainants' Exhibit No. 17 offered an index?

A. It does.

Mr. O'Sullivan: I offer Chart D in evidence and ask that it be marked Complainants' Exhibit No. 25.

Recross-examination by Mr. Riker:

Q. Mr. Provost, this paper was prepared in the same manner and from the same data as the last exhibit?

A. Yes.

Mr. Riker: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 25.

Marked Complainants' Exhibit No. 25.

Redirect examination by Mr. O'Sullivan:

Q. Did you cause any other chart to be prepared for the purpose of showing the locations of the sampling and mud stations?

A. I did. I have another before me, Chart E, from the plates of the United States Coast and Geodetic Survey, marked Harlem River, New York. On this map I caused to be plotted locations of the various stations contained in Exhibit No. 18, which lie within the territory covered by this chart.

Mr. O'Sullivan: I offer that in evidence and ask that it be marked Complainants' Exhibit No. 26, being Chart E.

Recross-examination by Mr. Riker:

Q. Mr. Provost, you prepared this in the same manner and from the same data as the last exhibit?

A. Yes.

Mr. Riker: The same objection.
1248 The Commissioner: Note the objection.
Received and marked Complainants' Exhibit No. 26.
Marked Complainants' Exhibit No. 26.

Redirect examination by Mr. O'Sullivan:

Q. Were there any other charts prepared in the same way that you have described under your direction, and in your office, by your draughtsmen to show the location of these mud and water sampling stations?

A. There were and I have before me Chart F from the plates of the United States Coast and Geodetic Survey, marked Hudson River from 53rd Street New York City to Fort Washington. On this chart I caused to be shown the location of the sampling stations contained in Exhibit No. 18, which lie within the territory covered by this chart.

Mr. O'Sullivan: I offer Chart F in evidence and ask that it be marked Complainants' Exhibit No. 27.

Mr. Riker: I object to the offer on the same grounds appearing in the questions and answers that it was prepared in the same manner and on the same data.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 27.

Marked Complainants' Exhibit No. 27.

Q. Did you cause any other charts to be prepared in the way that you have described under your direction in your office and by your draughtsmen?

A. I did, one other chart, Chart G, which is from the plates of the United States Coast and Geodetic Survey, marked Hudson River, New York to Haverstraw, New York and New Jersey, Polyconic projection. On this map I caused to be plotted the location of the sampling stations contained in Exhibit No. 18, which lie within the territory covered by this chart.

Mr. O'Sullivan: I offer Chart G in evidence and ask that it be marked Complainants' Exhibit No. 28.

1249 Mr. Riker: You got the location of the sampling stations from the same data as testified to in the past?

The Witness: I did.

Mr. Riker: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 28.

Marked Complainants' Exhibit No. 28.

By Mr. O'Sullivan:

Q. Mr. Provost, wherein do charts A, B, C, D, E, F, and G, that have been marked in evidence, Complainants' Exhibits 22, 23, 24, 25, 26, 27 and 28 differ from Complainant's Exhibit No. 18?

Mr. Riker: I object to the question on the ground that the differ-

ence will appear on an inspection of the exhibits if they are properly in.

The Commissioner: Note the objection.

Mr. Riker: Also object on the ground that this witness is not competent to disclose the difference, that that might be left to the intelligence of the court.

The Commissioner: Note the objection.

The Witness: As to the general distinction to be made between them, I might state that the topographical groundwork of the tracings which were prepared by Mr. Merritt were taken from the same United States Government Charts, as have been introduced in evidence just now. For convenience in handling Mr. Merritt copied only portions of these charts, so that his resulting 16 sheets might be of the same size, and he made that division by limiting his boundaries of latitude and longitude to that purpose and not taking the limits of latitude and longitude which exists in the entire charts, which he used for the ground work of the topography. In other words, the 16 drawings under Exhibit 18 are all of the same exterior size. The charts which have just been introduced are of various sizes and of various scales as produced by the United States Gov-
1250 ernment, and in order to transfer the information contained in Exhibit 18 upon the Charts A to G, which have just been introduced, it was necessary to lap over the information contained on these sheets, 1 to 16, in Exhibit No. 18, on the several charts, and that has been clearly shown by delineating the different sections covered by Exhibit No. 18 upon the Charts A to G inclusive, by different colored lines, each referring to the particular section of Exhibit No. 18, from which it is taken, and on which it is shown.

Q. Can the location of any desired station be as well ascertained on Exhibit No. 18 as from the exhibit numbered 22 to 28 inclusive, which have not been introduced in evidence?

A. They could be equally well identified on each.

Q. And to what does Complainants' Exhibit No. 17 relate, which of the sets of exhibits?

A. Complainants' Exhibit No. 17 is an index prepared for reference to Charts A to G inclusive, which have just been introduced?

Q. Have I now elicited full knowledge from you on the locating of these sampling stations?

A. I know of nothing else that I could say to add to it.

Q. Now, taking up the laboratory work to which you alluded in your previous testimony, what does that consist of?

A. I have already testified regarding that in a general way. I may say in addition thereto that my connection with that work, related chiefly to conferences with the staff and with the consulting experts regarding the methods to be adopted in the analytical work, and so far as possible every means was taken to secure accurate reliable results from the data available.

Q. Who were the staff to whom you just referred in your testimony?

A. The technical staff. I refer to Mr. Merritt he was in charge,

to Doctor Parsons, the bacteriologist, and Dr. P. Schuyler Miller, the chemist and the consulting staff consisted of Dr. George C. Whipple, Dr. William H. Park, and Dr. Daniel D. Jackson.

1251 Q. You mean the Doctor Jackson, who is the superintendent of the Mount Prospect Laboratory?

A. He is the Director of the Mount Prospect Laboratory.

Q. Now, what relation did you have to bacteriological examinations?

A. My principal relation with regard to that work was in connection with the locations from which the samples were to be taken, the order of occupying these stations and consultation and decision; with regard to the methods to be adopted in the laboratory in examining the samples.

Q. Were reports made to you as you stated in other particulars from the chemical and bacteriological examinations?

A. They reported to me daily.

Q. Reported what?

A. Daily.

Q. Were any microscopical examinations made of the samples, and if so, state what?

A. There were some microscopical examinations made. They were not extensive. They were made chiefly for the purpose of deciding as to what extent that portion of the work should be taken up.

Q. And the physical examinations, what relation did you have to those?

A. Principally with regard to the extent of their character and the general nature of the determinations.

Q. What did you do with the chemical analyses and the bacteriological examinations as they were reported to you daily; what did you finally do with them?

Mr. Riker: I object to the question on the ground that it is immaterial.

Mr. O'Sullivan: It is in the line of the witness' duty that he has testified to.

Mr. Riker: Primarily we are trying to elicit facts testified to in a legal manner, not his duties. He is not on trial.

The Witness: Those reports were received by me from the technical staff and remained in my custody, and the information

1252 contained in them was transferred by me to a series of tabulations, showing all of the analytical data and memoranda relating to each sample in proper sequence, and in a proper location. As these reports were received by me they were usually individual. That is, the physical examination would be reported on one sheet and the chemical examination on another sheet and the bacteriological examination on another sheet. So that my services in connection with this report was to collect them and tabulate them into a concise table, where all the information in regard to a given sample might be readily available.

Q. Did you so tabulate them?

A. I did.

Q. And in what form do they appear now in this case?

A. I have before me a volume of blue prints, entitled "Data relating to water samples, Nos. 1 to 931, from New York Bay and vicinity, examined by the Metropolitan Sewerage Commission in 1907, Sheets 1 to 23 inclusive.

Mr. Riker: Is not that marked as an exhibit?

Mr. O'Sullivan: Describe it.

The Witness: It is marked Complainants' Exhibit No. 20.

Q. Who caused the tabulations to be made that appear in Complainants' Exhibit No. 20?

A. I did.

Q. Taking as your basis for such tabulations what?

A. The daily reports made to me by the technical staff.

Mr. Riker: I object to these questions and answers on the ground that this witness has gone into the matter at least twice before. This is the third time.

The Commissioner: Note the objection.

Q. In what other exhibits do these tabulations that were prepared as you testified under your direction appear?

A. I have before me a volume of blue prints, sheets 1 to 17, marked Complainants' Exhibit No. 14, data relating to mud samples Nos. 1 to 705, which were compiled by me from the daily reports made to me by the technical staff.

1253 Q. And which work you have already heard testified to by Mr. P. Schuyler Miller and Dr. Parsons?

A. I have.

Q. What other exhibits?

A. This data is also shown on Complainants' Exhibit No. 12 and on Complainants' Exhibit No. 19.

Q. I understood you to say there were miscellaneous investigations and studies, such as shore inspections, what did you do on that?

A. There were quite a number of miscellaneous examinations and investigations made during 1907. The first of these as I recall it related to examinations as to the extent to which floating debris was cast upon the shores of New York Harbor; for this purpose an inspector was employed to visit the shores and to report daily as to the amount and character of the material cast upon the shores which he could recognize as being so cast up. That examination related chiefly as I recall it to the eastern side of the harbor, from about Gowanus Bay south, down through the Narrows and into Gravesend Bay. That examination was followed by a detailed examination of the shores of the ocean for some forty or fifty miles along the Long Island coast, and for a similar distance south along the New Jersey coast. The particular object of these investigations was to determine the effect upon the shores of garbage dumped at sea. Immediately previous to this examination, the garbage reduction works in Jamaica Bay at Barren Island, was destroyed by fire, so that for a limited period of two or three months as I recall it, the contractors handling the city garbage were obliged to dump the garbage at sea, and

the investigation was for the purpose of showing where and to what extent floating garbage grounded on the shores of New Jersey and Long Island. And during these investigations, and as a result of the information obtained by the examinations, the point of dumping was changed two or three times, and the final point decided upon and afterward used was at quite a remote point beyond the Scotland light as I recall it.

1254 Mr. Riker: Counsel for defendants asks counsel for complainants whether testimony as to garbage dumping was intended to be elicted by any question asked by him. Counsel for Complainants appearing not willing to answer that question, I move that it be stricken out as irrelevant, having nothing to do with the issues of this case, and not charging the State of New Jersey.

Mr. O'Sullivan: Counsel for complainants desires to answer the question put by counsel for defendants that it was sought to be elicited by this question the entire scope of the shore inspections, as to whether the deposits found thereon were due to garbage dumping at sea, or due to the deposits from sewage discharged by sewers either on the New Jersey shore or on the Manhattan or Brooklyn shores.

Q. Did you commission entertain any sewerage schemes?

Mr. Riker: The question is objected to on the ground that it is entirely immaterial as to what they entertained as to sewerage schemes.

The Commissioner: Note the objection.

A. Under the provisions of Chapter 639 of the Laws of 1906, creating the commission, it was the duty of the commission to determine not only the present conditions of pollution in the harbor and in the waters adjacent thereto, in the vicinity of New York, but also to determine, if possible, the extent of future contamination of those waters. And for this purpose, a study was made by the commission of important sewerage schemes which were in project, under way, by the various municipalities naturally draining into or adjacent to these waters. The attention of the commission was drawn, and their examinations covered projects for sewers, large sewers. Among these being the Bronx Valley Sewer, which proposed to drain a large section of Westchester County, with a
1255 discharge into the Hudson River. There were two or three large sewers contemplated for the Borough of the Bronx, with proposed discharge into the Harlem River. There was a large sewer projected in the Borough of Queens called the Ingleside Sewer, which was to drain a large territory adjacent to Flushing and Jamaica, with a proposed discharge into the Flushing Creek. There was a large sewer approaching completion on Long Island, the Webster Avenue Sewer, draining a territory running through Woodside and Winfield. In the Borough of Brooklyn, there were several large sewers projected or approaching completion, in the Bay Ridge, Gravesend and flat lands district and another sewer for the flat lands district with a proposed discharge into Jamaica Bay. There were

also some sewerage schemes under way in the Borough of Queens for draining the southern slope from the backbone of the Island to Jamaica Bay.

Mr. Coult: Discharging where?

The Witness: Into Jamaica Bay. And there was also the projected Passaic Valley Trunk Sewer with a proposed outlet in New York Bay, near Robbins Reef Light. All of these sewerage schemes engaged the attention of the commission to a greater or less extent, and some idea was obtained as to the relative importance of each scheme and the extent of discharge might occur at these outlets within a reasonable time.

Q. What was the final object of entertaining all these schemes and discussing them?

Mr. Riker: I object to it on the ground that this witness is not competent to testify to the final object of the commission, unless they expressed it.

A. The object was, as I already stated, to comply with that section of Chapter 639 of the Laws of 1906, which directed the commission to ascertain, so far as possible the future extent of pollution of New York Harbor and adjacent waters from sewerage discharge.

Q. And as to the sewage capacity or digestive capacity
1256 of those waters?

A. Certainly.

Mr. Riker: I object on the ground that it is leading.

The Commissioner: Note the objection.

Q. What was done by the commission as to the existing tidal current and tidal discharge observations?

A. The work done by the commission in studying the tidal currents and tidal discharge in New York Harbor was confined to a study of the existing data, from surveys, experiments and gaugings made by the Army Engineer Corps over an extended period of time.

Q. Did the commission concern itself with the local nuisances?

A. It did.

Q. To what extent?

A. It extended quite extensively to some of the more pronounced conditions of local nuisance, such as existed at that time in the Gowanus canal, in Newtown Creek, in the Wallabout Canal and in Coney Island Creek and some portions of the Harlem River and in some of the slips of the City of New York, adjacent to sewer outlets, with particular reference to the extent of the local nuisance existing at that time.

At 12 o'clock adjourned for noon recess until 1 P. M.

1257 Afternoon Session, 1 p. m.

December 28th, 1911.

ANDREW J. PROVOST, Jr., recalled, on behalf of the Complainants for further examination, testified as follows:

Redirect examination (continued) by Mr. O'Sullivan:

Q. Did you finish the answer to the last question?

A. I might say that the examinations made in these places consisted of visual observations of the conditions there, supplemented by the taking of samples for chemical, physical and bacteriological examinations.

Q. Did you investigate the feasibility of using harbor water for sprinkling streets?

A. We did. We made some investigation on that subject. The matter was brought to our attention by some of the civic bodies who were proposing to use harbor water for street cleaning purposes. An examination was made by the commission to determine the suitability of such water for that purpose. Samples of the harbor water were taken near the principal fire pumping stations, and these samples were exposed to sunlight, and shadow and the temperature such as it existed in the several streets and bacteriological plates were made from these samples and examined under normal conditions, and inferences were drawn as to the suitability of the water for the intended purpose.

Q. And what did you find?

A. In the reports which we made at that time to the City Club, it was said that it was unsuitable, the use of the water for sprinkling of public streets?

Q. Did you give any reason?

A. The principal reason as I recall it, was that the river water bacteria were quite persistent in their life, and there was danger of pathogenic germs being spread upon the street and taken up by the dust and blow into people's faces and nostrils.

Q. And was that report predicated upon the previous work
1258 that has been done by the bacteriologists on the samples?

A. Yes, predicated on the results.

Q. Now, with reference to the distribution of salinity at different depths and at different points in several different cross sections during several tides, during freshet and normal flow of the North River, East River, and New York Bay, what did they do in relation to that?

A. Extensive examinations were made in that direction. They consisted of a number of cross sections, different parts of the harbor, dividing those sections up into stations, and then over a single tide, or series of tides, under various conditions. Taking the water from the surface for sampling purposes, also at various depths, varying about 10 feet from the top and bottom, as I recall, and examining those samples for the amount of salinity contained in the water. The first cross section that was occupied was from about the Battery to the New Jersey shore. Another cross section was in the East River

above the Brooklyn Bridge, from the Manhattan shore to the Brooklyn shore, a number of stations being on that cross section. Another cross section occupied water from Staten Island across the Narrows to the Long Island shore, and another cross section from the Kill von Kull across to Bay Ridge. Those stations were occupied for a number of hours in each case and a repetition of samples were taken. That is the first station would be occupied for instance at 10 o'clock in the morning, and several samples taken at various depths. The boat used for taking the samples would then proceed to a point about one quarter of the distance across the river, using the Hudson River as a basis for this explanation—and at that place the samples would be taken in the same way at the surface and at various depths. The boat would then proceed to mid stream and numerous samples were taken there from the surface down towards the bottom. Then another station would be occupied at
1259 three quarters of the distance across and similar samples taken at that point. Then the boat would proceed near the shore and more samples would be taken. Then it would return to the first station and repeat the series of samplings across the river, occupying each station in the same way it was occupied in the first series, and so on throughout the day until a large number of samples had been obtained at each station at different depths. The samples were taken to the laboratory then and examined for salinity, in order to determine the relative salinity at different points of a cross section at different depths. This cross section of the North River was occupied during freshet flow of the Hudson River early in March, 1907. It was occupied again, as I recall it about the last of March, or the first of April, when the freshet flow has ceased, so that the comparison was available as to the conditions of salinity during the normal flow of land water and during the acute flow of land water, such as existed during the freshet flow of the Hudson River.

Q. Did you make any special studies of the extent of the oil and petroleum waste and their deposits throughout the waters of the floor of the harbor?

A. Yes, the examinations in this direction were quite extensive. The floating waste is most noticeable in the East River about Grand Street up to 42nd Street. It occurs at times as large floating fields of oily scum. These were noted, the location of these oil fields were noted on several occasions and samples of mud were taken from the bottom in the vicinity of the oil works, and out toward the center of the harbor, to determine how much of this material was deposited on the bottom. The same experiments were made over toward Bayonne, where the Standard Oil Company operates, and other independent companies operate, and the floating oil was observed in the harbor, there, and samples of the bottom mud were taken and examined for mud. In some cases a small vial
1260 of mud was distilled from a comparatively small sample of the mud——

Q. In your laboratory?

A. In our laboratory. That was recognized as petroleum waste product, and it was found to extend over a considerable portion of

the harbor bottom in greater or less extent. The condition of that oil and its effect upon the mud was also examined in various places to determine what effect the presence of a coating of oil had upon the natural destruction of the muds with which oil came in contact, as I recall it, in most cases, a smaller number of bacteria were found in the mud immediately adjacent to the oil, than existed below the oil at some depth or in other parts of the harbor where oil was not present.

Q. And this oily scum that you traced in the areas that you have described, does that interfere with the re-absorption of oxygen in the atmosphere?

A. It would have that effect.

Q. As well as destroying the bacteria that disintegrates sewage?

A. Yes, has an antiseptic effect also.

Q. Did those studies include the effect of the oil itself on the assimilation of sewage by our harbor waters?

A. To the extent that it was determined that the oil has an antiseptic effect on the destruction of organic matter by bacterial action.

Q. After conducting the long series of investigations that you have described, did you take any definite action with regard to house bill No. 178 introduced in the New Jersey Legislature in February 1907, and if so, state what?

Mr. Riker: I object to it on the ground that it is immaterial and irrelevant.

The Commissioner: Note the objection.

A. The commission authorized a communication to the Mayor of the City of New York, calling his attention to the introduction of that bill in the New Jersey Legislature, and recommend-
1261 ing to him that steps be taken by the City of New York and by the State of New York to prevent the passage of that Act as against the interests of the City and State of New York.

Q. When was that?

A. The bill was introduced in the New Jersey Legislature in February, 1907, and about the time of its introduction, that communication was addressed to the Mayor.

Q. And that House Bill No. 178 in the New Jersey Legislature in February, 1907, what did that propose creating?

A. That bill created the Passaic Valley Sewerage Commission, established the drainage district, and provided means of obtaining moneys for its construction and maintenance.

Q. In the discharge of the duties of the commission, did it seek conferences and hearings with the New Jersey State Sewerage Commission with respect to co-operative work with regard to the harbor waters and their sewage capacity?

Mr. Riker: I object to the question as irrelevant and immaterial.

The Commissioner: Note the objection.

A. It did. And under the provision of Chapter 636 of the Laws of 1906.

Q. What State?

A. The Laws of the State of New York, 1906, the Metropolitan Sewerage Commission was directed to cooperate with any duly authorized body or commission, having similar authority in the State of New Jersey in a joint investigation and consideration of the various subjects specified in the Act of 1906. Acting on the stipulations of the Act the Secretary of State of the State of New York was requested to communicate with the Secretary of State or with the Executive Department of the State of New Jersey requesting that State to designate a body having similar authority in the State of New Jersey which could co-operate with the Metropolitan
1262 Sewerage Commission in New York.

Q. Relative to what?

A. Relative to co-operating in the interests of the purposes of Chapter 639 of the Laws of 1906. That was to ascertain as to the present, and if possible, the future conditions of pollution in the Harbor of New York and report remedial measures for their abatement and improvement.

Q. Was that the object with which you sought these conferences?

A. That was the object, such a letter was written. Such a letter was written by the Secretary of State to the Executive Department of the State of New Jersey and the State of New Jersey replied that they designated the New Jersey State Sewerage Commission as the body in that State which had, if any, the power to co-operate as expressed in the New York Act of 1906. Thereupon the Metropolitan Sewerage Commission issued invitation to the Sewerage Commission of the State of New Jersey asking for a joint conference for a discussion of the matter and in accordance with this request a meeting was held at 17 Battery Place and it was attended by the members of the two commissions. The question of co-operation was discussed and referred to sub-committees from the two bodies for further conference. At least one conference of the sub-committees resulted from this meeting. That also was held at 17 Battery Place at the office of the Metropolitan Sewerage Commission. At that time the several members of the two committees discussed the plan of co-operative work in which the New York Commission was to carry out its line of studies within the waters of the State of New York, and the New Jersey Commission was to consider their ability to carry out similar studies, with respect to the waters of the Bay adjacent to or belonging to the State of New Jersey.

Mr. Riker: Doctor, I have had no opportunity to object to this testimony, inasmuch as it is given in narrative form, but as I want to put an objection on the record, I cannot do it very well
1263 except by adding a motion to strike out his testimony that is being given in narrative form. I desire to place on the record here, an objection to this testimony, notice of motion to strike it out on the ground that it does not appear that the New Jersey State Sewerage Commissioners have any authority in the premises and they are not a party to this litigation, and that transactions with them are entirely outside of the issues in this cause,

and cannot in any way bind the Passaic Valley Sewerage Commissioners, one of the defendants, in this cause.

Mr. O'Sullivan: Counsel for Complainants by pursuing this line of inquiry desires to have it appear upon the record that New York State made every laudable effort to obviate the threatened pollution which the Passaic Valley Sewerage Commission threatens this City with and was finally left to this remedy in equity——

The Witness: The New York State Sewerage Commission thereafter notified the Metropolitan Sewerage Commission of New York that they had power and authority to act in accordance with the discussion held at that conference.

Q. What finally was the outcome of these conferences?

Mr. Riker: I object on the ground that the transactions between the New Jersey State Sewerage Commissioners who are not a party to this suit and are not in any way connected in the evidence, either with the State of New Jersey or the Passaic Valley Sewerage Commissioners, is irrelevant here.

The Commissioner: Note the objection.

The Witness: The Metropolitan Sewerage Commission continued with its work.

Q. I am inquiring, Mr. Provost, relative to the results that flowed from these conferences, if any, did you get the co-operation that you sought?

Mr. Riker: I object to it as immaterial and irrelevant

1264 The Commissioner: Note the objection.

A. To my knowledge no co-operative work was done. That is, to the best of my knowledge.

Q. Were any conferences had with the United States War Department Engineers, with respect to the nature and extent of these important harbor deposits that you have described?

Mr. Riker: The question is objected to as calling for an answer that is immaterial and irrelevant, and that cannot possibly bind the defendants.

The Commissioner: Note the objection.

A. In the late summer of 1906, the War Department Engineers in this district addressed a letter to the Mayor of the City of New York, calling his attention to important deposits of putrescible matter, probably sewage, which was being dredged by the Army Engineers in their construction of the Ambrose Channel, as indicated in the examination of those conditions. The Mayor referred the matter to the Metropolitan Sewerage Commission which appointed a committee to examine, and this committee met Colonel Marshall, the United States Engineer, at his office in the Army Building, and had conferences, and thereafter went with him and with his Assistant, Lieutenant Babcock, to the Ambrose Channel, and witnessed the operations of dredging by centrifugal dredging machines operated by the Government, and noted the character of the material which was being ex-

cavated by the dredges and placed in the scows. The Army Engineers claimed that the material at that time of the year was of so putrescible and disgusting a character, that the men working on the scows were made sick during their labor.

Q. And did they have to suspend the dredging operations on that account?

A. They did on certain days, as I remember it.

Mr. O'Sullivan: Your witness, Mr. Riker.

Recross-examination by Mr. Riker:

Q. Mr. Provost, your connection with the matters you have
1265 testified to has been purely that of a recording or clerkly office, has it not?

A. No.

Q. What original work did you do in connection with any of the matters that you testified to?

A. As Chairman of the Committee on Harbor Work, I had general supervision of all these examinations, which I have testified today on.

Q. Did you make any of the examinations yourself?

A. I went on a great many of the trips and saw the samples taken, and I saw afterwards the analyses in the laboratory.

Q. Have you any records of any of the examinations that were made by you personally?

A. I have none in my memory at this time.

Q. Where were the observations of wind direction and velocity made, that you testified to yesterday?

A. Made at the Arsenal Building, Central Park.

Q. Did you make any of them?

A. I did not; they were made by Dr. Draper's representatives.

Q. You took them merely from publications of the officials in whose charge the work was?

A. I took them from the document which has been put in evidence in this case.

Q. The observations of the tides that you testified to yesterday, did you make any of them?

A. I testified that I took them from the records of the Department of Docks and Ferries.

Q. You abstracted them from those documents, did you not?

A. I did.

Q. And that is what you testified to yesterday, was it not?

A. Yes, I stated how I got them.

Q. You have testified as to the taking of samples of water through various months of the year 1907. Were you present when those samples were taken?

A. Some of them.

Q. Was your testimony based on your original records of your presence at those samplings?

A. Not altogether.

1266 Q. Was any part of it taken from that?

A. Yes.

Q. What part?
A. I cannot say now.
Q. As a matter of fact the figures that you gave of the number of samples taken during the various months of that year were collated by you from reports made to you?
A. Largely taken from the daily reports made to me by the technical staff.
Q. And when you testified that they were actually made, you simply mean to say that you believe they were actually made?
A. I believe they were made.
Q. You testified as to the contents and as to the legal effect of House Bill 178 introduced in the New Jersey State Legislature in the year 1907, and you said that that bill purported to establish the Passaic Valley Sewerage Commission?
A. As I recall it.
Q. Well, are you sure about it?
A. Well, I have not seen that bill for some little time. I was testifying from memory.
Q. Why do you testify if you do not know?
A. I testified to the best of my recollection in the matter.
Q. You testified that that bill undertook to establish the limits of the district of the Passaic Valley Sewerage Commissioners, did you not?
A. I think so.
Q. Do you think that is it, from reviving your recollection of that bill at the present time?
A. I do. I might change my mind if I saw the bill.
Q. How lately have you seen that bill?
A. I do not recall when I saw it last.
Q. Do you know whether that bill became a law or not?
A. From my recollection it did.
Q. Have you examined the Act of the New Jersey State Legislature which embodied that bill?
A. I have.
1267 Q. Do you think those matters are embodied in that Act?
A. That is my recollection at this time.
Q. If I refresh your recollection by referring you to the Act of 1903, establishing the Passaic Valley Sewerage District Commissioners, will that change your mind?
A. Not necessarily.
Q. You do not remember any such Act?
A. I do.
Q. And you still think it is embodied in the Act of 1907, do you?
A. I still think so.
Q. Did you keep records of the meetings with the New Jersey State Board of Sewerage Commission?
A. The New Jersey State Sewerage Commission?
Q. Yes.
A. I did.
Q. Where are they?
A. In the minutes of the Metropolitan Sewerage Commission.

Q. The matters that you are testifying to here orally, are based on those minutes?
A. I think most of what I said orally appears in those minutes.
Q. Are you in charge of those minutes?
A. Not at the present time.
Q. You are Secretary of that Board, are you not?
A. Not at the present time.
Q. You were Secretary at the time?
A. I was at that time.
Q. And the minutes are in existence, are they not?
A. I presume they are.

Mr. Riker: That is all.

OLIN H. LANDRETH, a witness called on behalf of the complainants, recalled, for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Professor Landreth, were you a member of the Metropolitan Sewerage Commission?
A. Yes, sir.
1268 Q. In what years?
A. In the latter part—the last of the year 1906 and during the whole of 1907.
Q. And you were a member of the previous commission, the New York Bay Pollution Commission, were you not?
A. I have been, yes.
Q. And you have testified in this case as to the work that you did as a commissioner of the New York Bay Pollution Commission?
A. Yes, sir.
Q. If I remember, a part of the functions of that New York Bay Pollution Commission was to recommend in its report to the Legislature of the State of New York that a larger commission be created with more extended powers and a larger appropriation?
A. Part of the duties as prescribed by the Act creating it were to consider and recommend what action should be taken, and under those general instructions the committee considered the matters and concluded and recommended that a larger commission should be established and specified the powers.
Q. And I think you testified that your commission went so far as to tentatively draft a bill for that purpose that you recommended?
A. I did.
Q. And substantially that was enacted?
A. Substantially.
Q. And how did you become a member of the Metropolitan Sewerage Commission that was created by that Act?
A. I was appointed a member by the Mayor of the City, who, by that Bill was given the power of appointment.
Q. What Act, if you recall, created the Metropolitan Sewerage Commission?

A. The Act of Chapter 639 I think was the number, of the Laws of 1906 of New York.

Q. Now state what you did as a member or commissioner of the Metropolitan Sewerage Commission?

1269 Mr. Riker: That question is objected to on the ground that it is immaterial and irrevalent as to what he did as a member of that commission.

The Commissioner: Note the objection.

A. I attended nearly all the meetings and I attended the meetings of the committees to which I have been assigned, and I attended to a great many assignments which were made at the meetings, which were not made committee matters. The first matter to which the commission gave attention was the question of its organization. Then the scope of work to be undertaken and the methods of work to be adopted in carrying out the scope undertaken. And then the provision of the means for carrying them out, including the securing of quarters and provisions for a laboratory, and the provision of means for securing samples of water, and the provision of means for making such observations in the Harbor as the scope of the work determined and made necessary. I was a member of a number of committees which bore on those subjects and attended to the individual subjects which were assigned to me, and took part in the general work, I think of all the committees to which I was assigned. That in a general way was the nature of the work. I also aided in passing on the personnel of the observers' staff, selecting individual assistants, the laying out of their prescribed duties and the preparation of the regulations and directions for their guidance. The adoption of forms and methods for their reports and the general constant inspection of the work which they were doing, as a member of the committee having that in charge.

Q. To what committees were you assigned?

A. I was assigned to a number of committees, I think the first one was a committee appointed to determine what unexpended balance of money was available from the preceding New York Bay Pollution Commission, and whether it was available for the work of the Metropolitan Sewerage Commission or not. I
1270 was also a member of the committee appointed to take up with proper attorneys, the question of the matter of the legal questions involved in the Metropolitan Sewerage District and Commission. I was also appointed a member to co-operate with the New Jersey officials. I was appointed a member to block out tentatively the district or area of territory which should receive attention from the Metropolitan Sewerage Commission. I was also appointed a member of a committee to consider the status of the Bronz Valley Sewer project. I was appointed a member of a committee to consider and report on the question of separate as opposed to combined systems of sewers for the City of New York, for future enterprise. I had also been appointed a member of a committee on the Order of Business. I was a member of the Committee on Harbor Work, which had charge of the observations in the harbor, the obtaining

of samples, the making of observations, the provisions for the laboratory, direction of the the laboratory assistants. I was a member of that committee of which Mr. Provost was the Chairman.

Q. What was the scope of the work undertaken by the Metropolitan Sewerage Commission, and for what purpose?

Mr. Riker: I object to it as immaterial and irrelevant.

The Commissioner: Note the objection.

A. The general purpose of the work, the general aim in laying it out was to secure information in the form of scientifically obtained data, which would bear on the general impressions as to the general conditions of the waters of New York Harbor and adjacent bodies of water, more particularly with respect to their present precise status, the question of pollution and also with respect to their capacity to receive and satisfactorily digest or dispose of further pollution. In carrying out that undertaking the first features which we concluded to undertake was to determine
1271 the facts as to sources of present pollution. As to what existing sewers were discharging into the Bay and adjacent waters, what trade wastes were being discharged, what materials were being discharged from aboard ship, and what materials were being discharged from other sources. Secondly, to determine the status of the waters under that burden of pollution. Under the general class of chemical observations, bacterial observations, physical observations, and microscopical observations. The scope of work undertaken in respect to that second class was to establish as many as possible stations, for the obtaining of samples and at each station to secure samples of water for each of the four examinations and also at some of those stations to obtain samples of mud deposits on the bottom of the harbor. For the purpose of considering what had been the past history as to accumulations or sedimentations of material on the bottom at those points. Those observations similarly were exposed to chemical bacteriological microscopical and physical examinations, not the same, however, as those to which the water samples were exposed.

Q. What was the object of making your examinations of mud deposits?

A. We had three things in mind primarily,—we considered it important to determine the extent—the history of what had been transpiring as to sedimentary deposits in the different parts of the harbor in past time, to include as an important feature the answer to the question how far the organic material of the waters about the bottom had been deposited at various points. In that first respect, therefore, to use the deposits as a register of what had been transpiring in the past. Second to ascertain to what extent the deposits were likely to be objectionable for navigation purposes, and third, to determine to what extent the deposits were or were likely to become objectionable from the production of odors and putrefactive changes taking place in the organic matter contained in the
1272 muds. Those were the three primary purposes of mud examinations.

Q. There has been some testimony given here relative to an implement used in obtaining samples of mud deposits at various depths below the surface of the water. I hand you Complainants' Exhibit No. 15, and ask if you know anything about the implement therein set forth?

Mr. Riker: I object on the ground that this witness has already been examined on that very exhibit, and he has testified on this very same subject.

The Commissioner: Note the objection.

A. Yes, I know something about that?

Q. Whose invention was the implement?

Mr. Riker: I object to that on the ground that the record shows that this witness already testified that it was his own invention.

The Commissioner: Note the objection.

A. It is my own invention.

Q. What was the object of taking samples of the mud deposit at various depths below the surface of the mud and underneath the water?

A. It was so that we might ascertain just how far down into the mud the organic matter had extended. In other words to how great a depth and how sedimentary deposits had extended since the time that the harbor waters carried organic matter. Also to obtain material on which to predict the rate at which that deposit was then growing and as to the depth. Also to obtain an idea as to the likelihood that that material now was or in future might become objectionable from putrefaction, and giving out odors. In many places we found that the bottom of the harbor was clean, the original geological material being here in the form of sand or gravel in some cases even rock indicating that no deposits whatever had been going on in recent past time. In other cases we found
1273 that the deposit was of a very considerable thickness, and contained for many feet below the surface evidences of organic material, indicating to us that the deposit was not only going on, but was going on at a rapid rate, and had accumulated a considerable depth, even during the time that the waters of the harbor had been heavily polluted. And we found all gradations between the two extremes. In some places we found that the only sedimentary materials going down were of the foreign or organic matter, very little of the mineral or truly legitimate sedimentary silt. In some other places we found that the deposits were largely sedimentary silt, with a little organic material contained in them. In order to study the accumulation of material on the bottom intelligently, and without the risk and uncertainty of erroneous impressions and conclusions, we concluded that it was desirable that samples taken at the same station at different depths should be carefully protected from contamination during the act of being sampled and drawn to the surface. Each sample should be properly protected from infection from the samples above it or below it, and also from the water through which the sample had to be drawn

in bringing it to the surface. The apparatus which is shown on Exhibit No. 15 was prepared to meet that need.

Q. Were you a member of the Committee on Harbor work of the Metropolitan Sewerage Commission?

A. I was.

Q. What duties were assigned to that committee?

A. That committee had executive charge of all the work of obtaining samples of water and of mud, and directing the processes and methods to be employed in their sampling and in their laboratory examinations, and in the formulating of the results of such examinations. That committee also had in charge the provision, for the conduct of all experiments, to determine the direction of tidal currents in the harbor and for that purpose, planned and executed the observations which have been testified to by
1274 Mr. Provost in this case already. They also had in charge the making of general inspection for certain portions of the harbor, and of certain portions of the shores bounding the harbor, with a view to ascertain where and to what extent the shores and beaches were receiving pollution by floating material. They also had in charge the conduct of some experiments to obtain information bearing on the suitability of using harbor waters or waters from the harbor for the purpose of street sprinkling in New York City. Those in general were the functions of the committee.

Q. Now, with regard to the float observations, Professor Landreth. I draw your attention to Complainants' Exhibit Nos. 4 to 11 and ask what significance the work done in the float observations had?

A. It enabled us to obtain information, which, as far as we are able to ascertain, did not then exist, as to the direction and velocity of movement of the particles of water under the influence of the rise and fall of the tide. Of course we had ample information concerning the rise and fall of the tide, as to when it occurred and when the high tide was reached at various points, and when low tide was reached at various points, but very little material bearing on the matter of the direction which the particles of water took in their path, in moving in and out of the harbor, and this series of observations was made and executed for the purpose of throwing light on the question, as to just where a particle of water, which might later become a vehicle for sewerage transport, where it went, and how fast it moved, and what became of it after the tide turned. We appreciated that the movement of any particle of water at the surface or immediately below the surface, but near the surface, was actuated by two causes. First, the cause of gravity arising from the tidal water producing a slope down which the water tended to
1275 flow out on an ebb tide, when the slope was out, and inward at the flood tide, when the slope was such as to move down hill into the harbor. The other cause—I may say that that first cause we appreciated was more or less regular and attributable to known causes and susceptible to fairly full and complete analysis. A large amount of material had been gathered as to strictly tidal phenomena, all of which material was made the subject of use and examination by our commission.

The other cause, however, under which water was impelled to move was the varying effect of winds. The effect of wind on the water itself producing movements of the sheet of water, forming the surface. And inasmuch as that surface sheet of water would and does become the vehicle by which some portion of the sewage and polluting matter is moved, we wanted to know in just what way and in what direction and with what velocities that moving sheet of water actuated by these two causes, tidal flow and wind action, would move. We did not want to include in the latter any portion of the wind action, blowing on an object projecting above the surface. We did not want to know where a sail boat or a row boat or a log projected above the surface would go. We wanted to know where the water itself went. So we placed carefully our floats and arranged our observations so as to throw light, as far as possible, on the question of where the particle of water moved when it started from a given point, how fast it went, what became of it at the turn of the tide. That was the signification, that was the purpose of the series of observations on the floats.

Q. And what application would these observations have to the line of investigation to be made by the Metropolitan Sewerage Commission relative to the disposal of sewerage, by our tidal waters?

A. They will form the ground work on which it will be
1276 possible to draw conclusions, concerning the ultimate behavior and movement of sewage, so far as it is carried by a portion of the water substantially near the surface, and inasmuch as a large portion of the sewage discharges and will always come to the surface near the surface it is evident that a knowledge of where the water from that sheet of surface material goes is important as telling us where the sewage in that volume of surface water will also go, as bearing upon its diffusion in the harbor, and as bearing on its being cast on the shores, and as bearing on its swinging back and forth into and out of the harbor, thus permitting an accumulation of the nuisance which occurs from masses of sewerage accumulating and gathering in the harbor and floating on the surface. It also bears somewhat on the question of corroborative evidence, more or less, as to the formation of deposits; the fact that sewage actually flows in a certain direction and at a certain velocity might be expected to lead to the formation of deposits there even without any sampling, and the making of sampling observations and current observations in that respect were intended to be corroborative, one on the other, as far as it relates to the influence—the path of the floats as affecting sewage deposits. We should not expect to find, and we have not found where velocities were high, that there were any deposits whatever. In fact it may be said in general that the highest velocities were accompanied by the least amount of deposit on the harbor bottom.

Q. What precautions were taken in the float observations to secure as near accurate determinations as were feasible under the conditions?

Mr. Riker: The question is objected to on the ground that it does

not appear that this witness was present at any of the float observations.

The Commissioner: Note the objection.

1277 A. We took the precaution to expose as large an area of the float surface to the influence of the water currents as possible and to expose as small a surface of the float area to the wind surface as was possible. For that purpose the floats were made very large and extensive under water, and made just as small, exposing as little surface as possible above the water, appreciating that while a given motion of the air would have a realtively small effect to that of an equal motion of the water, still, it might have some effect and that movements of the air which happened to be counter to those of the water might lead us to misleading conclusions, if the air had been permitted to exert an influence on the float, and we prevented that influence by making the area exposed to the air just as small as it was possible and leave the float visible, and by making the area exposed to the water current just as large as we could obtain. For that purpose we used a very thin sheet of metal, of large lateral extent for the part below, and for the part above, we used very slender rods, a foot and a half or so in height, not over half an inch thick, a half or a quarter of an inch, carrying a small flag perhaps 5 or 6 or 7 inches square in size, just so you could follow them with a boat and keep them at all times visible.

Q. The float that you have described now, do you regard as a scientific apparatus for the purposes that you have testified to?

A. I do.

Q. Now, taking into consideration the description you have given of the small area exposed to the wind and large area exposed to the water, what approximately would you state the relative influence of the water and the wind were upon the floats used as you have described?

A. I have not made any attempt on a mathematical calculation, but the relative areas were many many times as great in the case of the area exposed to the water, as in the case of the area
1278 exposed to the wind, and area for area, that is to say, the influence on a unit area would in many cases be much smaller for the same area exposed to the air as compared with that exposed to the water, on account of the fact of the greatly increased density of the water as compared with the density of the air, the measure of the force of impulse being directly proportional to the square of the velocity, and directly proportional to the mass of material moving. The mass is indicated by the density. Inasmuch as the density of the air is a small fraction of the density of the water, and inasmuch as the area exposed to the air—the number of units of area exposed to the air is small as compared with the number of units exposed to the water, my conclusion is and was that the influence of the air was entirely negligible.

Q. Have you had opportunities to study those exhibits, which I handed you, and which showed the determinations of the float observations?

A. Yes, sir.

Q. When?

A. When they were made, when they were afterwards plotted and since they were plotted.

Q. What inference, if any, have you drawn from your studies of these float observations?

Mr. Riker: I object to the question on the ground that this witness has not qualified himself as an expert to draw inferences from these observations, and that the inferences are quite as obvious to the judges as they would be to this witness. Therefore, the question is immaterial and irrelevant.

The Commissioner: Note the objection.

Mr. O'Sullivan: Counsel for Complainants fails to see the utility of an objection that declares in one breath that the question calls for an expert interpretation, and in the next says that it is so obvious that even a layman can draw the interpretation. I offer this gentleman as an expert. If you have any doubt on it you may qualify him.

1279 Mr. Riker: I do not have to qualify him. You have to qualify him.

Mr. O'Sullivan: If you question his being an expert, I offer him as such, and I am now giving you an opportunity to see whether he is or not. I offer Professor Landreth as an expert.

Mr. Riker: I object to his testimony on the ground that he has not been qualified.

The Commissioner: Note the objection.

Mr. O'Sullivan: I offer you the opportunity to test his ability.

Mr. Riker: I do not have to qualify him; he is your witness.

Mr. O'Sullivan: You can test his ability when I offer him as such.

The Witness: The first and most important conclusion drawn from these observations is that a particle of water at almost every portion of the harbor undergoes a reversed motion during the two phases of tide. That if it flows down to or even outside the Narrows, it returns on the flood tide and enters the harbor again, and on the contrary that a particle of water which starts—we will say the beginning of flood tide, enters the harbor and returns to or a little beyond the same point of starting at the end of the ebb tide. The conclusion from that taken from either one or a set of continuous tidal observations, is that the mass of water simply swings back and forth in the harbor, up stream at flood tide, down stream at ebb tide, progressing somewhat seaward at a resultant rate depending on the time of the ebb, and more particularly depending on the volume of the net resultant of tidal ebb flood over and above the flood tide. That in turn depends on the amount of land water which enters the harbor when the rivers, particularly the Hudson River, is at its flood tide. The net resultant progresses toward the sea more

1280 rapidly. A particle of water will swing back and forth a fewer number of times before it ultimately remains out to sea. Then, during the summer time when the low stage of the rivers coincide with the climatical conditions, being favorable to

the production of nuisances, then the seaward progress of the water is slow, and a particle of water moves nearly as far up stream as it does down stream at any one phase of the tide. Were there no fresh water entering the harbor at all, a particle of water would on the average simply swing in and out up and down, and it would make no general progress either seaward or landward, if affected only by the tidal influence alone. The wind would tend to send it out, and also the wind from the south would tend to send it in. Would tend to keep it farther and farther up stream.

Q. Did your duties as a member of the committee on harbor work, of the Metropolitan Sewerage Commission have anything to do with the sampling of the waters testified to?

A. Yes, sir. We had to do entirely with the adoption of the methods of sampling and with the selection and engaging of observers, and with the way those observations were conducted, how they conducted their sampling operations, and prepared the samples for laboratory treatment. Also had to do with the adoption and designing of apparatus necessary in the taking of samples.

Q. What do you say of the apparatus and design used in the taking of these samples?

A. I say that that subject was very carefully studied by the committee on Harbor Work, and in order to be more fully authentic we engaged consulting analysts to consider and recommend the best forms of apparatus, and the best methods available for conducting the observations and samplings with the greatest amount of efficiency as to the quality of the work, and with the least possibility of errors.

Q. Were you at that time or are you now familiar with the details of the collection of these samples and their subsequent examinations by the chemists and bacteriologists?

1281 A. I was at that time and I am somewhat familiar with it still. A great many points have passed from my mind I should say by this time.

Q. Were you familiar with the reports at that time, at the time they were submitted to the secretary, Mr. Provost, whom you heard testify today?

A. Yes, sir. I did not myself see them every day, but our Harbor Committee had a meeting about once a week, I should think, and sometimes several times a week, sometimes perhaps they were as far as two weeks apart, and at all meetings of the Harbor Committee one of the important parts of the program of work was a report on progress, what had been done, what methods had been followed, and the results which had been reached, and our committee was constantly watchful for opportunities to improve its methods, and as to how to eliminate possible sources of uncertainty or defect, which was discovered at any time.

Q. Did you, as a member of the Harbor Committee, or the Committee on Harbor Work of the Metropolitan Sewerage Commission, have anything to do with organizing the laboratory force, and directing their mode of examinations, and analyses in the laboratory?

A. Yes, sir.

Mr. Riker: I object to the question on the ground that the question is immaterial and irrelevant what the Committee did in that regard, the question being what was done, not what it was intended should be done.

The Commissioner: Note the objection.

A. Yes, sir.

Q. To what extent, state fully what you had to do with it?

A. To the extent of first carefully going over a survey of the field for the purpose of selecting the men most suitable for the line of work. Second, and the second was carried on in conjunction with the first, the proper and most suitable division of work as between different personal observers. Third, the drawing of a general
1282 boundary line between the work of each observer and that of the others, and fourth, the preparation of detailed modes and methods to be followed by the observers themselves. That portion I may say was made the subject of very careful study first with the consulting analyst and also subsequently with our detail observers themselves before their final adoption. In a number of cases we made comparative trials or practical experiments to determine the relative efficiency of one or other of the methods of doing the same line of work. We were constantly under the stimulus and impulse to accomplish the greatest amount of work with the least amount of money, also to accomplish the greatest amount of work with the least amount of error, and to have the work in such form as to be of the most use in being read or interpreted to solve the problems, which the whole enterprise was planned to carry out. In the selection of our observers we were fortunate in choosing men who had had considerable experience in their respective lines of work, and naturally we deferred to their opinion in many matters of detail, as to detail processes, but even in that case, the deference to their recommendations was made a matter of conference and discussion and deliberation before it was adopted as the formal method for the observers.

Q. As to the location of stations for the securing of samples of water, what methods were used under your direction?

Mr. Riker: I object on the ground that Mr. Merritt has testified that he located the stations himself.

The Commissioner: Note the objection.

Mr. O'Sullivan: He actually located them. This man directed it.

Mr. Riker: The important fact is who located them?

A. The Harbor Committee as a Committee discussed at a special meeting just where it seemed best to conduct the determinations. Those conclusions were left in somewhat general form.
1283 The chairman himself was delegated with the authority and the power to explicitly locate in more particular detail the exact locus and those instructions were communicated by him to the Engineer Analyst in charge of the harbor operations, and by him they were actually located and actually occupied for sampling.

Q. Were there any particular objects to be served in designing

or selecting or directing the locations at which the stations were to be?

A. Yes, sir. There were a number of objects to be sought. One was where we should obtain key observations or data, which would tell us where further observations would need to be made. Second, that there were certain critical points, specially favorable by their locality, at which we desired to have certain observations made, such as, for example, the Battery, as forming the mouth of the Hudson River and forming an opportunity for the determination as to just what passed down the Hudson River. So, also a section from the Battery to New Jersey was taken, and a series of stations located, for the purpose of determining just what contribution to the total burden of pollution the Hudson River at that point contributed. Then, again, other stations were located with respect to determining just how fast deposits were taking place, and then again other stations were located to show progressively what differential results were found by following along a certain axis or line, as for example, we desired to know what changes of pollution occurred along the line in passing through the Kill von Kull and up into Newark Bay. In order to ascertain what changes took place in the waters of Newark Bay as they came out into New York Harbor. Those are illustrations of the various objects we had in mind in studying carefully the locus of stations in general.

Q. And what you have described, would you say those were technical points to select for cross sections?

1284 A. Yes, I think that would characterize them, cross sections and lines. They were not all cross sections. They were cross sections and actual lines of observation.

Q. What I want to get at Professor, is whether or not these locations were haphazard or whether they were decided upon by design; what was the method of giving these instructions by this Committee on Harbor Work of the Metropolitan Sewerage Commission?

A. As far as I remember, there were no observations made in what you have spoken of as hap-hazard fashion. As I recall it, every one was a part of an attempt to obtain some specific piece of information, and it was located where it was with the belief that it would there best contribute to answer such questions. There was no haphazard work, although from the chartered mass, as it strikes the eye, might give that impression as you look at it in flat. I can say there was no haphazard work in selecting stations. We did allow, of course, to the Engineer Analyst more or less discretion in the placing of the exact spot for a series of samplings to meet the conditions under which he had to labor. For example, at certain times he was not able either to ascertain the depth of water on account of the shallowness of the draught, or at other times the state of the harbor as to wind and wave were such as precluded him doing a certain piece of work at a certain point at a certain time and we allowed him a certain latitude as to when he might do that.

Q. When you say "he" and when you use the term "Engineer Analyst" who do you refer to?

A. Referring to Mr. D. S. Merritt, but all his work even when a

given that latitude was under the general direction and for the general purpose, or series of purposes outlined, and Mr. Merritt understood those purposes and those objects as well as we did and concurred fully in the program and carried it out very intelligently.

1285 Q. Did you give the Engineer Analyst, Mr. Merritt, any instructions as to the method he should employ in making these locations, whether he should use a sextant or other means of getting the locations approximately accurate?

Mr. Riker: The question is objected to on the ground that the instructions are immaterial and irrelevant. If the fact is relevant at all, it is what he did, not what he was instructed to do.

The Witness: We did. The question of determining precisely his locations was a matter of careful consideration by the Committee on Harbor Work, and there, as in the work of taking the sample itself, we adopted the methods which were conducive to the greatest amount of result, with the least amount of expense and the least amount of error, but in every case the methods were adopted—when I say "we" I mean of course the Harbor Committee transmitting its instructions through the Chairman, who was of course given more or less discretion as to how he should express those, and even Mr. Merritt, the Engineer Analyst, was given more or less discretion as to the making, executing of those observations. For example, while Mr. Merritt understood the necessity for the highest precision obtainable in the location of the station, consistent with doing a considerable amount of work, he was left some latitude as to whether he would depend on, we will say, using a street line, as base line, by lining up perhaps with some other street in sight, or whether he should take a sextant observation, or whether he should depend entirely upon the sextant observations, but in every case the requisite precision was indicated, and he was expected in the exercise of his discretion to use those methods which should bring him within that limit of precision and accomplish the greatest measure of work, with the least resultant error. The methods in general were as I think has been testified before, to depend entirely upon natural lines which could be reproduced from maps, such as the prolongation of street

1286 lines or to depend on sextant observations, from well located visible points, or to depend on both, and as a precaution against error, every sextant observation was made in duplicate. That is to say we took observations so that we could attain the location from two distinct angles. The location of a station by the sextant method involves the measuring of two angles simultaneously. We always had three, if we had no stated line to base the operation on, in order that we might accomplish the location, at least two distinct angles.

Q. Did the committee on Harbor Work of the Metropolitan Sewerage Commission prescribe the methods to be used not only by the Engineer Analyst, Mr. Merritt, but by the laboratory workers?

A. He did.

Mr. Riker: I object on the ground that it is irrelevant.

The Commissioner: Note the objection.

Q. Now, as to the sampling of the muds and the locations of the stations, what did you as a member of the Committee on Harbor Work of the Metropolitan Sewerage Commission do?

A. Well, I was a member of the committee on Harbor Work, and as such took part in its deliberations and discussions, determinations, resolutions, on the topics which have been mentioned, as well as others, but particularly in the matter of the supplying of an apparatus—I think that matter was referred to me specifically. At least I did make a search of the scientific field, the literature to ascertain what apparatuses were available, and failing to find any suitable, I made the design for the one described here. That was made as a member of the Harbor Committee, and reported to the Harbor Committee.

Q. What did you as a member of the Committee on Harbor Work of the Metropolitan Sewerage Commission do relative to the chemical analysis of the water samples and mud samples, which
1287 were taken under the conditions that you have described?

A. My work in connection with that was confined to meeting with the Committee as a member, deliberating with them, and aiding in the discussion of the most appropriate set of methods for those lines of work. I did not, so far as I now recall, have any personal assignment of work in conjunction with that. I did make some private, some individual examinations, inquiries, concerning available men to secure for the work, but beyond that I think my work was confined to committee work.

Q. Did your Committee direct the methods to be employed by the Analyzing Chemist?

A. Yes, after conference with and reports from and discussions of the subject with our consulting analyst.

Q. Did your Committee prescribe the methods to be employed in the bacteriological examinations?

A. We did. After the same or similar studies with our consulting Analyst. We consulted the Bacteriologist in that case; I may say in conjunction with that, we had some new problems to attack and solve before adopting methods, and for that purpose, we made, as I remember quite a number of experimental observations for the purpose of trying out different methods. The methods which were finally adopted were those which were used in expressing the results which are given in the exhibits in this case.

Q. What exhibits do you refer to?

A. I refer to Complainants' Exhibit No. 14. Those methods that are there shown represent the result of this experimental inquiry into what determinations had best be made, and how we could best determine them.

Q. What particular exhibit do you refer to now?

A. I refer to Complainants' Exhibit No. 14. The question of mud examination was a new one comparatively speaking. There had been official or standardized methods adopted, employed by scientific
bodies for that purpose, as had been the case in the water ex-
1288 aminations, which had been more commonly made, and being desirous of obtaining the very best results, we made not only

careful inquiries and comparative examinations, but also we made a number of comparative experiments to determine the best available laboratory methods for analyzing the deposits found, and as I said the results which are expressed in this Exhibit No. 14, represents results found by those methods. For example the reports on the bacteria, on the *the* frequency of bacteria. We could not there follow the method employed on water, which is to take the count of bacteria per cubic centimeter per volume of water. So we adopt the standard of expressing the bacteria per gram of dried mud. Not that we dried the mud and then examined the bacteria, but we obtained the numbered of bacteria and obtained the weight of the mud when it was wet, and then reduced it to dry weight by laboratory drying, and expressed the result of the count of bacteria in terms of the number of bacteria per gram of dried mud.

Q. As to the examination of the mud samples, for evidences of trade waste, what object would there be in that examination?

A. The object would be to contribute something to the general series of existing facts appurtenant to the question of harbor pollution. We wanted to know just to what extent the polluted muds were polluted by sewage, if possible to determine it, and how far they were polluted by petroleum, how far they were polluted by gas house and light wastes, how far by other wastes, how far by the naturally water born organic matter which comes down every stream. Those were the purposes of such examinations.

Q. What influence did the trade wastes, such as was discovered on these examinations, have upon the sewerage capacity of the harbor waters?

A. In at least two instances the influence was clearly to diminish the sewerage capacity, and the instances to which I refer are the discharge of petroleum waste and the discharge of gas house wastes. In both those instances the sewerage capacity, as indicated by the decomposing capacity, and that is indicated by the bacteriological count, was diminished by the presence of petroleum waste
1289 and the gas house wastes.

Q. What influence would the scum and grease on the surface of the water have upon the re-absorption of oxygen?

A. Would tend to diminish the atmospheric absorption of oxygen thus diminishing the digestive sewage capacity of the harbor water for a further burden of sewage.

Q. What would be the action of the trade waste as found on the surface of the water and as found in the muds of the bottom of the water, on the sewage or the digestive capacity of the harbor waters in their immediate vicinity?

A. The action would be cumulative, tend to diminish the digestive capacity of the harbor waters and also incidentally tend to change the nature of the decomposition of the muds discouraging aerobic reduction, and encouraging putrefactive decomposition, which is objectionable mainly on account of its production of disagreeable odors.

Q. For instance?

A. For instance, if a particle of sewage which is deposited in the

bottom of the harbor — permitted to be decomposed by the oxygen using bacteria, or as we speak of them the aerobic bacteria, the decomposition is carried on without the production of harmful odors, but if the aerobic bacteria cannot operate, then their opposites do, that is the anaerobic, those thrive and operate on the organic matter without oxygen, and it is a fact, it is an accident of their operation that they produce a decomposition accompanied by highly offensive odors, and sewerage is one of those materials which is affected in that manner.

Q. So that you attach importance to the evidences of trade waste found on the surface of the water and in the muds or at the bottom of the water?

A. We did, not only as causing pollution themselves, but also as disturbing to a very material extent the reduction of the pollution of other substances, by interference with the oxygen contents of the water.

1290 Q. Did your committee prescribe for the laboratory workers any microscopical examinations, to be conducted of the mud sample gathered as you described?

A. We did. We did not carry that to a great extent, because of the lack of time and funds, but we did undertake a system of work of that sort and carried it to a slight extent. We made, however, in conjunction with that and fairly parallel with it, a continuous examination of the physical characteristics of mud samples in practically every case, and while we were not able to submit each sample of mud obtained to microscopical examination, we did not expose it to physical examination, first, as to color, then as to odor, and as to the formation of offensive odors, and as to appearance, and as to the presence of any one of a number of classes of material, such as small particles of hair, small particles of organic matter, the presence of cellulose, and a number of foreign materials which were sought for and reported. The presence of tar, the presence of petroleum materials, also the presence of vegetable fibres, also whether the material was putrid, and if so, whether it was slightly putrid or very putrid, or extremely putrid. Also whether the mineral matter was of a sandy nature, whether it was in the form of ashes or cinders, or if it was gravel, or clay, or ooze, and each sample was accompanied by a statement as to the depth at which that sample was taken below the bottom of the harbor, and those gave us means of judging as to the depth to which pollution extended into the depth. In other words, how much deposit occurred since certain polluting material had first been thrown down. How much of an accumulation of silt had grown up on top of the earlier deposits.

Q. Those matters that you have just now testified to, do they appear of record in any of the exhibits that have been put in this case by complainants?

1291 Mr. Riker: I object on the ground that the exhibits speak for themselves.

The Commissioner: Note the objection.

A. They appear of record on Exhibit No. 14 of Complainants' case, and are shown in the later column, the last five columns of each sheet, one column of which shows color, another column shows odor, the next two columns show the temperature and the depth of water and the last column showing under the head of remarks a great many facts concerning the conditions as found from the physical examinations.

Q. Of what?

A. Of the sample of mud and whatever microscopical examinations were made, they were also reported in that same column under the head of remarks.

D. Did your committee take any interest in the dredging operations in the Ambrose Channel in 1906?

A. We did.

Q. State what you did as a member of the Committee on Harbor Work of the Metropolitan Sewerage Commission in relation to dredging operations in the Ambrose Channel in 1906?

Mr. Riker: I object to it on the ground that it is irrelevant and immaterial as to what he did with reference to dredging operations that occurred in 1906.

The Witness: We took the opportunity of the dredging operations made by the Government. It offered us an opportunity of examining the operations going on there and to see the samples of material, as it was brought up by the government dredgers. We accompanied the army engineers in their boat, going around the place of their dredging operations along the different portions of the channel and I went aboard on at least one, and I think two of the sea going dredges which were in operation, examined the material as it was brought up and took samples of it. Found the depth at which it was taken, and obtained some further data and facts from the officer in charge as to the volume of such material and as to the depth from which it was taken and as to what was done with it. The general result of such examination—

1292 such information received was, that on the inner slope of the bar which lies well outside the Narrows and runs approximately from Sandy Hook to Coney Island, a little inside, that on the inner slope of that bar was a deposit of this material of foreign nature, varying from nothing in thickness on the crest of the bar to a depth of about 12 feet in thickness at a point where the channel was 40 feet deep. And we had no opportunity to determine how much there was below the 40 foot line. The depth of the water of the Narrows is considerably more than 40 feet, but we had no opportunity, as the Government had no occasion to dredge or bore into the bar to a greater depth than 40 feet, but at that point, the depth of sewage and sludge accumulated on the inner slope was 12 feet in thickness. That was entirely foreign material, consisting of the worst conceivable form of filth, in which the odors of sewage and petroleum and gas house waste and refuse of various sorts, artificial material were mixed in all sorts of con-

fusion, and which gave rise, when brought to the surface to most offensive odors. The bar seemed from that to be a sort of obstacle or a holder or actual bar which was keeping this material in the harbor, this material which is known to swing back and forth on the bottom, and to form almost—what we speak of as ooze, back and forth by the oscillatory movement of the water under the influence of the tide. It remains on the bottom, close to the bottom, not compact, lying there in a semi-liquid semi-solid state, and it moves down stream as other liquids will, but it cannot move up stream. When it reached the base of the bar, apparently it found a hill to climb, and it could not climb over it, therefore it had accumulated on the inner slope of the bar and is accumulating there now, at least I infer it is. There has been no change to my knowledge, which has altered that progressive accumulation.

1293 Q. And this bar which you described is, as you stated, a large deposit of sewage sludge itself?

A. No, sir, the bar itself is sand, but it forms a barrier which hedges in and gathers this sea going weight of ooze and sludge on the bottom, which would be able to float down the harbor if it had a level bottom, and which does flow down as far as is a level bottom, but it cannot climb the hill which the inclined face of the bar affords.

Q. What value or importance, do you attach to the discovery of that bar and the conditions there?

Mr. Riker: I object on the ground that this witness has not testified that he discovered the bar.

The Commissioner: Note the objection.

A. We knew the bar was there from many soundings and many dredgings that have been going on for years, through the bar. We did not know that the accumulation of sludge existed on the inner surface of the bar. We attached considerable importance to it as indicating what is going on in the bottom of the harbor. I do not attach special importance to it as giving rise to odors out there, because out there the result of odors was less considered, but I do attach great importance to it as offering information concerning what is going on in the inside harbor, and that information leads me to the conclusion that the lighter portions of the sludge on the bottom of the harbor, those portions which are too light to settle, they float around, they do that in every harbor which is heavily polluted with just that class of material. The Jersey flats are largely formed of material of that sort, which may be classified as ooze, too heavy to float, too light to sink further and too lacking in compactness to hold any water. That fact is so well known that in the city dredging by the Department of Docks in the different slips of the city, especially in Manhattan, their sounding rods, with which they determine the depth have to be shod with flat

1294 braces so that the weight of the rod shall not penetrate into the ooze, but stop there. That is the material which I am speaking of as travelling ooze. It is too light to sink and settle

finally into a compact bottom, and it moves down the harbor swinging with the tide and with the current movement, until it comes up against a barrier, which it cannot climb over.

Q. Is that ooze you have just described a source of pollution to the water above it?

A. Undoubtedly. It contains a very large proportion of organic matter and organic matter is undergoing at all times the operation of decomposition, and the presence of disturbing material such as trade waste, they tend to retard that rate of decomposition. That tends to admit of large amounts being accumulated before decomposition takes place, so that I should expect that where organic wastes which retard decomposition were present that the accumulations of organic matter would be greater in volume, simply because of the retarded action of the decomposition, permitting the large amount to accumulate before any of it had become thoroughly decomposed and removed.

Q. Were you present in your official relationship with this Metropolitan Sewerage Commission at any of the conferences held with the State Sewerage Commission of New Jersey during New York's State's co-operative efforts.

A. I was present in my official capacity at a conference between the Metropolitan Sewerage Commission and a sub-committee of at least one of the New Jersey bodies. I have not refreshed my memory by reference to the minutes, so I will not attempt to say whether it was the full commission or not. My impression is it was a sub-committee appointed for the purpose of meeting with us to ascertain what proposition we had to make concerning a scheme of co-operation. It is not impressed on my mind because it came to nothing, and therefore I do not recall just what committee it was.

1295 Q. Professor Landreth, did you as a member of that committee on harbor work, have anything to do with the shore inspections?

A. Yes, sir.

Q. State what you did in that respect?

A. I accompanied the committee on a number of occasions on the inspections of the shore and on the inspection of especially objectionable conditions of the—in other words local nuisances. We examined the shore lines along the Brooklyn front on two or three occasions, three occasions I think. We examined one portion of the shore above the Brooklyn discharge, and portions of the shore from the Navy Yard down to about Gowanus Bay, including Gowanus Bay, and another inspection of the shore below Gowanus Bay, going around to the point of Coney Island. On another occasion I also inspected the shore on the Bergen Peninsula off Bayonne, and on another occasion the Upper East River about 24th Street from there up a ways, and on another occasion going through the Harlem River at low tide to examine the deposits of material there. On various other occasions also I examined the docks and piers and the shores of the Upper North River, in fact various points from the Battery up to 129th Street on the North River.

Q. What was the object of those tours of inspection?

Mr. Riker: I object on the ground that it is irrelevant and immaterial.

The Commissioner: Note the objection.

A. To determine to what extent solid matter was cast on the shore attached to the docks and piles, and buildings, holds of vessels, and also to determine just what the bacteriological influence the water pollution had on the forms of life, especially the water flora, which attach to piers and so on. The examinations were made ocularly, that is by sight and smell. They were not accompanied, except in a few instances, by the taking of samples. In some, perhaps a dozen cases, they were accompanied by the taking of samples, but
1296 in most cases it was a physical examination of sight and smell, and it shows that at all points of the harbor the shores were, where the shores were visible—were covered with a thin coating of slimy sludge of different color and frequently of a dark color approaching black, and in many cases offensive to the smell when exposed above water, and in all cases interfering very materially with the normal water flora as they are ordinarily found, growing on piles and on stones on the shores, and other material exposed to the water. The water flora are remarkably sensitive to—they reflect in a very effective way the state of the water in which they are exposed. Many of them are hardy and resist being destroyed by pollution, but nevertheless, they indicate by their color and by their vigor of life and by the length of the growth of filimentous material, they reflect the condition of the waters, generally first by the color being discolored. In some instances where they have a bright clear sea green or even brighter shade of green as they occur in the chlorophyl-aceaous plants, they will appear of a dirty mud color green, then a darker green, and even black. If that goes on to the extent of impairing their life, they may become rusty and brown and mixed more or less with living forms which are still a badly discolored green. The examination of the water life we considered to be of importance as attacking and affecting one of the sources of oxygen production in the water. A chlorophyl-aceaous plant supplies oxygen to the water, and to that extent a chlorophyl-aceaous plant is just as valuable as a means of reduction of the organic matter as the oxygen supplied in absorbing from the atmosphere and I personally, and I think the commission attached very considerable importance to the contribution of oxygen to the waters which comes from vegetable sources and hence on that account we were watchful to see what effect pollution was having on those sources of oxygen.

1297 Q. In discussing these chlorophyl-aceaous plants do you refer to marine or land flora?

A. Marine flora.

Q. Apart from the deleterious effect, which these sewage deposits had on the water plants, how did it affect lice and insects of that kind?

A. It furnished an extremely luxuriant breeding ground for lice.

In all the inspections made during warm weather we found great volumes—and I found when I went alone, great masses, great numbers of lice and insects and in the upper regions mosquitoes inhabiting the territory and evidently encouraged there by the food supply, or by places for egg laying.

Q. Did you as a member of the Committee on Harbor Work interest yourself on behalf of the Metropolitan Sewerage Commission in the dumping of garbage at sea, and if so, why, for what purpose?

Mr. Riker: I object to it on the ground that it has no relevancy to the issue in this cause.

The Commissioner: Note the objection.

The Witness: Yes, and for the reason that the dumping of garbage, which at that time was seriously threatened constituted as we believed a serious menace to the condition of the harbor. And so we not only made careful shore inspections, but the commission—when I say this I am not sure whether it was done by the committee on harbor work or by a special committee. I think it may have been by a special committee. We made inspections of the conditions out at sea, going out, I think as far as thirty or forty miles or more and making a careful study and search of the surface of the sea to determine the presence of floating garbage. At that time it was being dumped out at sea, and we were anxious to know where it went, whether it went to the New York Shore the Long Island shore, or whether it went to the Jersey shore. Whether it came in with the tide or what became of it. That was the occasion of these inquiries.

Q. Did you follow the peregrinations of any of these fields
1298 of sewage or garbage as described by you?

Mr. Riker: I object to it on the ground that the witness has not testified to any fields of sewage.

The Commissioner: Note the objection.

A. I did not, no, sir. I knew other members of the commission had done so.

Q. Professor Landreth, will you please distinguish the terms "garbage" and "sewage" so that we will not have any objections such as have been landed or any confusion of terminology?

A. The term "sewage" is used in two rather distinct ways. One, and a very general and rather loose way, meaning anything that flows through a sewer. The other and more narrow meaning is that substance which comes from domestic refuse and such ordinary other domestic sources as will reach a sewer. Sometimes that term in that sense includes also offensive waste from manufacturies, and if those wastes are discharged into a sewer, then they are usually spoken of as sewage in general, and you can only distinguish when it comes to analysis, the material of the sewage into its different constituents. Garbage on the other hand is that class of refuse which is primarily itself foreign and is not so offensive as to preclude it being stored in receptacles temporarily, such as accumulates from the kitchens of domestic houses and the wastes from bake shops, refuse, not only of the vegetable and animal kind, but also of the less offensive such as

waste paper and derbis of domestic and industrial and commercial offices, and also it frequently includes in its terminology ashes and cinders. It may or may not be classified, be kept distinct in classes, according to the municipal regulations governing its collection. That in general is the class we speak of as garbage. Of course, it is entirely distinct from sewage.

Q. But stuff put into a barrel, apple parings and refuse and scraps of food, put into a receptacle by themselves, you would call that garbage?

A. Would call that garbage.

1299 Q. And if the same articles were discharged into a sewer you might describe it as sewage?

A. Yes, sir.

Q. What sewerage schemes of importance did your committee take under advisement?

A. Well, as far as we were able we acquainted ourselves with the probably known facts concerning the Passaic Valley Sewer enterprise. Also the large sewer inprovements in New York State and vicinity of New York harbor primarily in the large sewer being then about finished, discharging into the Harlem River from the Bronx. Into the projected sewer then being proposed for the Bronx Valley, and into several larger sewers from Brooklyn and Queens. And we, after careful consideration, sent a communication—after careful consideration and resolution—sent a communication to the Mayor of the City recommending that in all further sewer improvements in New York City, in the various boroughs, that the separate system of sewerage should be adopted, and that where that was not feasible that a sewer should be so constructed so as to make it most feasible later to attach it to disposal plants for the treatment or purification of sewage.

Q. Did your commission take any definite action relative to House Bill No. 178 introduced in the New Jersey Legislature in February of 1907?

A. We took action, calling the attention of the New York City officials to the same, I think also calling the attention of the Secretary of State to it. I have not refreshed my mind by the minutes of that, so that I am speaking somewhat indefinitely on the latter point, but we did take action and sent communications to the New York officials, city and possibly also to the State, calling attention to the bill in question and recommending that such action be taken as was needful to guard the interests of New York, such action as might be necessary.

1300 Q. Did your Committee on Harbor work take into consideration questions relative to the distribution of salinity at different points or depths or cross sections or otherwise?

A. Yes.

Q. Will you state for what particular purpose and what was done in that respect?

Mr. Riker: I object on the ground that it is immaterial and irrelevant.

The Commissioner: Note the objection.

A. The purpose was to obtain two distinct facts. First, the relative proportion of land water and sea water at every and any point observed, and second to ascertain the phenomena of the under-run at certain channels, by taking observations for the salinity at various points in the same vertical line, one at the surface and others distributed down toward the bottom. At the same time so as to obtain facts as to the existence and degree of the existence of the presence in a body of salt water below the surface of a stronger salinity than on the surface, commonly called the under-run or the influence of the movement of sea water along the bottom before it extends to the top. The result of such inquiry made by us and our other observers has concurred in indicating that when an ebb tide turns to a flood tide, the sea water comes in landward along the bottom first, or it may even come in while the land water is running out on the surface, so that there may be a flood tide on the bottom of the harbor, consisting of salt water coming in, and at the same time, the finish of the ebbtide, fresh water going out on the surface, and it was to ascertain just how far that phenomena of the under-run socalled took place. That constituted one of our objects of this series of salinity observations. The very fact that the salinity of the harbor differs in itself constitutes a very important fact in our belief as to the sewage disposal capacity of the harbor. A certain amount
1301 of sewage may be satisfactorily disposed of in fresh water and a certain amount may also be disposed of in salt water, but a different and lesser amount may be disposed of in water which is alternately fresh and salt, or, in other words, the water changes its degree of salinity from fresh through brackish to salt, and it was to determine just how wide this range of fluctuation of salinity extended that we commenced this series.

Q. You have spoken of the phenomena of the under-run; is that a frequent or a rare phenomena?

A. To the best of my impression the observations of it are rare. The occurrence of it is frequent. I believe it is a common occurrence in every harbor mouth. I do not know of but few observations having been made of it.

Q. And was that one of the objects of your making these cross section determinations and salinity tests?

A. It was, yes.

At 4 P. M. adjourned to December 29th, 1911, at 10:30 A. M.

1302 Supreme Court of the United States, October Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK CITY,
December 29th, 1911,—10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances:

Dr. William J. O'Sullivan, Special Counsel for the People of the State of New York.
Adrian Riker, Esq., of Counsel for the Passaic Valley Sewerage Commission.
Joseph Coult, Esq., of Counsel for the Passaic Valley Sewerage Commission.
Robert H. McCarter, Esq., Special Counsel for the State of New Jersey.

Met pursuant to adjournment.

OLIN H. LANDRETH a witness recalled on behalf of the Complainants, for further examination, testified as follows:

Direct examination (continued) by Mr. O'Sullivan:

Q. Professor Landreth, did you complete your answer to me relative to the phenomena of the under-run; did you get what the stenographer just read?

(The last question and answer repeated by the stenographer.)

A. I think that covers the question.
Q. Were your commissions called upon by any of the civic bodies to make a report on the condition of the harbor waters for any special purpose?
A. Yes, sir, we were called on by the City Club of New York to report on the feasibility and propriety of using harbor water for the purpose of street sprinkling in New York.
1303 Q. Did you make a report to the City Club?
A. Yes, the commission made first a tentative short report, or simply an acknowledgment, a short statement, and it was then followed by a rather extended investigation, and after that investigation was completed a report on the results of that investigation. The investigation brought out a number of things which had wider application than the question of street sprinkling, brought out in a very striking manner the influence of sunlight as affecting bacteria, and indirectly the effect of the clarity or clearness of waters after opportunity for sunlight to penetrate into the depths on the

bacterial activity, and thereby on the absorptive capacity of harbor waters for receiving sewage.

Q. Was that report based upon knowledge that your commission had acquired from its investigations conducted in the laboratory and otherwise relative to samples of the harbor water?

A. It was, yes, sir. The report was made on the results of the investigations, made for the purpose of answering the specific questions, which were submitted to the commission by the City Club.

Q. Have you got a copy of that report with you?

A. I have, yes, sir.

Mr. O'Sullivan: I offer this report in evidence and ask that it be marked Complainants' Exhibit No. 29.

Mr. Riker: I object to the offer on the ground that the report is immaterial and irrelevant, and that it has not been properly proved or authenticated.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 29.

Marked Complainants' Exhibit No. 29.

Q. When was that report made, Professor Landreth?

A. It was made in July 1907.

Q. And by whom was it signed?

1304 A. Signed by the President of the commission, I think (Witness examines report) (Continuing) Yes, signed by the President of the commission.

Q. And by what other officials?

A. And the Secretary.

Q. And that was sent as the report of the commission, of the Metropolitan Sewerage Commission to the City Club, was it not?

A. It was, yes.

Q. Will you read that report, Professor?

Mr. Riker: Well, now, Doctor, will you kindly state what is the purpose of having him read that into the record? Don't you think that is an imposition on human nature to make us sit here and listen to the contents of an exhibit?

Mr. O'Sullivan: There are certain parts of it I wish to take up with him on his direct examination.

Mr. Riker: All right, I have got a volume of the New York Water reports. You might mark time with that. I cannot see any purpose in taking my time here, whatever it may be of yours, to read an exhibit into the record. This is not a jury trial.

A. This report is dated July 25th, 1907. It is addressed to the Secretary of the City Club of New York, 55 West 44th Street, New York City, Dear Sir: Referring to your communication of June 5th in which you asked for an opinion based upon the studies of this Commission on river pollution, whether the use of river water as it is, would be undesirable for sprinkling or flushing city streets, we beg to state we understand from this that your inquiry relates to the suitability of water taken from the Hudson or East River for

use in sprinkling or flushing the streets of the Borough of Manhattan. In such case an opinion must take into consideration the pollution of the water to be used as measured by the presence of decomposable organic matter and of bacteria capable of producing disease. These questions have engaged the serious attention of this Commission for a number of months and many hundreds of samples of river and bay water as well as muds deposited
1305 therein have been carefully taken and subjected to chemical and biological analyses. The full conclusion to be drawn from this work would at this time be premature and improper. The weight of present evidence may however be stated to indicate strongly the probable inability of the waters of the East and Hudson Rivers and the Upper Bay to assimilate and destroy within a reasonable time the sewage wastes discharged therein. Some of the observations made would no doubt be of present interest to those who are giving the general subject their attention and without in any way emphasizing the relative importance of any particular observation this Commission is willing at this time to announce the results of a series of observations taken along a line projected from the Battery to Jersey Central Railroad Station on the New Jersey shore:

Bacteria per C. C. Hudson River Water, Feb. 20, 21, 1907.

Depth.	State of tide.	100' from Pier "A."	300' from Pier "A."	¼ way across.	Mid-stream.	¾ way across.	300' from N. J. C. R. R. Sta.	100' from N. J. C. R. R. Sta.
1'	Flood	6350	2850	4550	3900	3400	4550	580
	Ebb	7100	6350	3900	3500	3000	1900	300
20'	Flood	5200	5100	3900	3500	2850	4050	470
	Ebb	6350	5850	3500	3300	3300	3300	450
40'	Flood	4050	4550	2400	2400	2150		
	Ebb	4350	3900	2400	2500	2200		
50'	Flood	3900	2850	2350	....			
	Ebb	3900	4050	2150	2350			

The determinations at the stations 590 feet and 100 feet respectively from the Jersey Central Railroad Station were not observed. At the depth of 50 feet, the tide being flood.

Mr. Riker: I object, Mr. Commissioner, this witness is not reading the exhibit.

Mr. O'Sullivan: What are you reading?

The Witness: Reading from the exhibit.

Mr. Riker: He is not reading the exhibit, that is all there is to it, he is commenting on it as he goes along.

The Commissioner: Note the objection.

Mr. Riker: If he is going to read it, I suggest that he read
1306 it. I desire that an objection be put on the record. This witness was called upon to read the exhibit. I draw the attention of the Commissioner of the court to the fact that this witness is not reading the exhibit.

The Commissioner: The objection of counsel is noted.

Mr. O'Sullivan: Complainants' counsel contends that this witness is performing exactly what he was requested to do in the question, that is reading the exhibit and as it represents work done

by his commission, and for which he has been held responsible, to make such comments on it, that will illuminate or explain any parts of that exhibit.

Mr. Riker: That was not the question.

Mr. O'Sullivan: That was the reason why I suggested his reading the exhibit, as I would want him to explain certain parts of it.

Mr. Riker: Very well, I will move to strike out the answer on the ground that it is not responsive.

The Commissioner: Note the motion and objection.

Q. Go ahead.

A. These matters relate to the general duties of the Commission in determining the sanitary condition of the waters as a whole rather than to the question raised by the City Club and in order that certain special information required by your inquiry might be available it was decided to make a brief investigation of the biological effect of sprinkling with river water surfaces exposed to the same influences of air, sunlight and shade as would be the City streets under the conditions which you mention. For this purpose samples of North River water were taken at the site of the floating baths at the Battery early in the morning before the baths were opened, the tide being flood about one-half (½) full, the wind southwest and moderate. Two samples A. and B. were taken 20 feet from the Battery Pier, A. being 1 ft. and B. at bottom 15 ft. below the surface. The temperature of the water was 15½ degrees C.,
1307 the air being 27 degrees C. Both samples had eight points of turbidity, ten points of color, about 12000 parts per million of chlorine representing 2% sodium chloride and a faint sewage odor. After 48 hours sample A showed 6350 bacteria per C. C. and sample B 4770. Both gave a positive test for B. Coli (intestinal bacteria) in 24 hours.

A sample of sea water was taken from outside of Sandy Hook. This showed 0 points turbidity, 5 points color, 27000 parts chlorine equivalent to 4.5% sodium chloride, no odor, no bacteria and negative test for B. Coli. A portion of sample A mixed with an equal portion of this sea water, showed after 48 hours 742 bacteria per c. c., while another portion of sample A mixed with an equal amount of distilled water containing 30% sodium chloride (saturated solution) gave after 48 hours only 104 bacteria per c. c. The results of this test indicate the bacterial effect or relative strong solutions of salt.

Experiments on Samples of Street Dust.

Two samples of street dust were collected on sterile dishes.

A from spot always in sunlight.

B from spot always in shade.

Equal portions of each were added to 500 c.c. sterilized distilled water and plated. Sample A shows 1,200,000 bacteria per gram and sample B 8,000,000. Both gave positive tests for B. Coli in 1 c.c. and .1 c.c. Other equal portions of the two samples were then thoroughly wet with sample of river water before mentioned

taken from depth 15 ft. The samples of wet dust were then divided, one half of each being placed in sunlight and the other half in the shade. At the end of six hours all were dry at which time portions of all were mixed with 500 c.c. sterilized distilled water and plated.

1308

A	exposed	in	sunlight	6	hours	showed	440000 bacteria per gram
A	"	"	shade	6	"	"	800000
B	"	"	sunlight	6	"	"	700000
B	"	"	shade	6	"	"	3000000

Showing again the bactericidal effect of salt water and the more pronounced bactericidal effect of sunlight. All the above platings showed positive tests for B. Coli in 1 c.c. also in .1 c.c. except samples exposed to sunlight.

Similar tests were made with samples of the dust when sprinkled with the pure strong sea water before referred to and with distilled water containing sodium chlorine in saturation.

A	with	pure	sea	water	5	hours	in	shade	showed	636000 bacteria per gram
B	"	"	"	"	5	"	"	"	"	1400000 " "
A	"	saturated	sol.	nace.	5	hrs.	in	shade	"	120000 " "
B	"	"	"	"	5	"	"	"	"	140000 " "

confirming the greater bactericidal effect of salt in stronger solutions. All of the above platings showed positive tests for B. Coli in 1 c.c. and .1 c.c. except samples sprinkled with saturated solution of sodium chloride which gave negative tests in both cases.

Remarks.

The places and conditions of taking the samples of river water tested were most favorable as it is believed no purer water touches the shores of Manhattan Island than at the Battery during the strong flood of the tide. Although the tests showed conclusively that salt water and sunlight are somewhat inhibitive to the micro-organisms present in polluted water and in street dust it does not appear that the intestinal bacteria are destroyed by the water containing salt in quantities such as obtained in the river and
1309 harbor even when combined with exposure to sunlight for periods long enough to dry the dust containing these organisms.

The possible danger to public health from depositing the germs of disease known to exist in sewage wastes upon the streets whence they may be blown about when in a dry state, we do not believe has been sufficiently disposed of by the tests which we have made to permit us to assure you that the use of river water for flushing or sprinkling the City streets in its present state is desirable.

It is well known that typhoid bacillus will live from several hours

to several days in a dry state depending upon the amount of exposure to the sun. Other bacteria which may be present in sewage polluted river water live for varying lengths of time after drying.

This commission will continue the foregoing studies at other places along the river fronts of both the Hudson and East Rivers where the pollution of water is known to be greater than the samples heretofore tested and will be pleased to advise you further with respect to these studies should the results thereof tend in any way to modify the conclusions herein presented. Yours very truly. It was signed by the President, Daniel Lewis, and the Secretary Mr. A. J. Provost.

Q. Subsequent to that report was laboratory work continued on samples of river water?

A. I think it was to some extent, but not very extensively, and as I recall the results were simply corroborative and did not modify the conclusions reached in the report just presented.

Q. And up to the making of that report, did the laboratory work on the water samples indicate that the river waters and the tidal waters of New York harbor were sufficiently polluted so that they would be a menace to health if used on our streets?

A. The commission concluded that it would be at least
1310 unwarrantable in the present state of knowledge, and were of the opinion that it would be really dangerous to health. I may say that in the making of these tests, no special opportunities were given for the drying above those which pertain in the laboratory. In that respect the conditions were more favorable to a legitimate use than they would be in actual street conditions, where the movement of the winds would tend to accelerate the rate of drying, and produce a drying in a shorter time as well as very greatly adding to the dust as being a vehicle of movement for its dangerous distribution.

Q. In your examination of the mud samples, did you regard these deposits from organic sources as foci of pollution for the water itself that lay above them?

A. We did. We did believe that those on the surface of the harbor bottom, in that they were in a condition to have bacteria including pathogenic bacteria transmitted into the water, and transported about where the portions which lay below the surface and which were necessarily under anaerobic conditions would give rise to putrefactive odors, the escape of which through the water would be not only harmful to the water, but apparent to the sense of smell above the water.

Q. How many samples of mud were examined at a foot of depth below the harbor bottom?

A. In the space between the surface and 1 foot in depth the Metropolitan Sewerage Commission examined 13 samples.

Q. How many at the surface?

A. 336 samples at the surface of the mud.

Q. Now, will you state at what other depths, the number of mud samples, giving the number, were examined?

A. In the space between one foot below the surface and 2 feet

below the surface the number of samples examined was thirty-five. In the space between 2 feet in depth and 3 feet in
1311 depth, the number of samples examined was 51. Between 3 feet in depth and 4 feet in depth, the number was 48. Between 4 feet and 5 feet, the number was 54. Between 5 feet and 6 feet in depth, the number was 48. Between 6 feet and 7 feet in depth, the number was 36. Between 7 feet and 8 feet in depth, the number of samples examined was 32. Between 8 feet and 9 feet in depth the number of samples examined was 15. Between 9 feet and 10 feet in depth, the number of samples examined was 9. Between 10 feet and 11 feet in depth the number of samples examined was 18. Between 11 feet and 12 feet in depth, the number of samples examined was 8. Between 12 feet and 13 feet in depth, the number of samples examined was 4. Between 13 feet and 14 feet in depth, the number of samples was 3. Below 14 feet no samples were observed. At least no samples were observed which *has* been obtained by the regular boring apparatus.

Q. How many of these samples of mud were examined for the bacillus colon communis?

A. The total number of samples examined *by* B. Coli communis was in one cubic centimeter, 275. The number of samples examined in one tenth cubic centimeter was 259. The number of samples of mud found to contain B. Coli in the one cubic centimeter was 261 out of the 275. The number of samples of mud found to contain B. Coli in the one tenth cubic centimeter was 227 out of the 259. The number of samples found not to contain, or not found to contain B. Coli in one cubic centimeter was 14 out of 275. The number of samples not found to contain B. Coli in the one tenth cubic centimeter was 32 out of 259.

Q. At what depths, that is in samples taken at what depths, what particular depths were those B. Coli found?

A. Species of the B. Coli were found in 198 samples immediately on the surface of the bottom of the harbor. Between the surface and one foot one sample was found. Between one foot and two feet in depth below the harbor bottom, 15 samples showed B. Coli.
1312 Between 2 feet in depth and 3 feet in depth, below the harbor bottom, 16 samples showed B. Coli. Between 3 and 4 feet in depth 10 samples showed B. Coli. Between 4 feet and 5 feet, 12 samples showed B. Coli. Between 5 feet and 6 feet 7 samples showed B. Coli. Between 6 feet and 7 feet 2 samples showed B. Coli.

Q. Were any of those mud samples subjected to putrescibility tests?

A. Yes, sir. 110 samples were observed for putrescibility, of which 105 were found to be putrescible and 5 were found not to be putrescible.

Q. Were any of these samples of mud examined as to odors, and if so, state how many?

Mr. Riker: Mr. Commissioner, I observe that this witness is using a memorandum in his testimony, I desire to ask what it is, what is the memorandum you have in your hand, professor?

The Witness: This is an abstract of the numerical data drawn from Exhibit No. 14 in this cause.

Cross-examination by Mr. Riker:

Q. Made by whom?
A. Made by myself?
Q. And is simply comments on the evidence that is already in?
A. No.
Q. You made them?
A. I made them?

Mr. Riker: I object to the use of the memorandum as it does not appear to be a memorandum made at the time so as to refresh the witness' memory. It appears to be only a compilation of evidence, or alleged evidence already in the case.

The Commissioner: Note the objection of counsel for the defendants.

Redirect examination by Mr. O'Sullivan:

Q. Professor, what is it that you are reading from?
A. I am reading from a memorandum prepared by myself comprising an abstract, a numerical abstract of the data grouped
1313 together in such manner as to throw light on the various points which are pertinent to the investigation, as to the character and characteristics of the mud on the bottom of the harbor. Exhibit No. 14 shows the data assembled all together for each sample. In this particular abstract, which I prepared, this memorandum, I have brought together certain characteristics. I have indicated the number of samples taken between stated depths. I have also indicated the number of samples which discover or show the presence of B. Coli, and I have shown the numbers of samples which show B. Coli at the different depths, all as bearing on the question of the pollution of the deposits, which lay under the bed of the river, not confined to the surface alone, but showing the depths of those deposits.

Mr. Riker: I further object to the use of the memorandum on the ground that by the witness' own statement, it appears to be simply his own opinion as to the legal effect of evidence already in the cause.

The Commissioner: Note the objection of counsel for the defendants.

Q. Did you take into consideration its legal effect in answering the question put to you.
A. I have not.
Q. Do the facts that you have given in digested form here appear in the exhibits or in any of the testimony given so far?
A. They do not.
Q. Was the work that is spread upon the tabulations in Complainants' Exhibit No. 14 done under the supervision of yourself as a member of the Committee on Harbor Work?

A. It was done under the supervision of the Committee on Harbor Work, of which I was a member, and took an active part in.

Q. And now you are interpreting the values of the work done under the supervision of that Committee on Harbor Work?

A. I am interpreting it so far as grouping together cer-
1314 tain data of similar kinds goes. I should hardly call that interpreting, but simply grouping or tabulating.

Q. Now, as to the odors observed in the examinations of these muds on the various samples?

A. The odors were observed and stated for each sample and they were classified under their appropriate classes.

Mr. Riker: I observe that the witness is again using a memorandum. I desire to inquire what the memorandum is that the witness is now using.

Recross-examination by Mr. Riker:

Q. What is the memorandum?

A. This memorandum is a tabulation or an abstract of the results of the analyses given on Complainants' Exhibit No. 14, tabulated or specified so as to bring all the odors of the same kind together and give the number of those odors.

Q. When was this memorandum prepared?

A. It has been in the process of preparation by me during the last two months.

Q. When was it completed, the one before you remember I am speaking of?

A. The tabulation was completed within the last—about—three weeks ago.

Q. What is it based on?

A. It is based on Exhibit No. 14.

Q. Does it contain any new matter?

A. None whatever.

Mr. Riker: I object to its use. It simply contains this witness' own evidence and has no probative value.

The Commisioner: Note the objection.

Redirect examination by Mr. O'Sullivan:

Q. Are those tabulations comprised in any evidence that is in this case so far?

A. No, sir.

Q. What are they that counsel for the defense has just asked you about?

A. They represent classifications of the odors stated in Exhibit No. 14 into groups of the same kind. Thus I have a list of odors which resemble sewage, odors which indicate sulphuric hydrogen; gas odors; petroleum odors; mouldy odors; earthy odors; woody
odors; coal tar odors, fishy odors aromatic odors, putrid odors,
1315 burnt rubber odors, creosote odors and then a group of samples which were odorless. I have grouped under those re-

spective heads the number of samples which showed indications of these several distinct kinds of odors, and I have also graded them according to the designations found in Exhibit No. 14, as to their severity, into three classes. Those which are faint, those which are of ordinary strength, and those which are strong, and I have given the number of samples, which show each of the kinds of odors under each of these respective three kinds of severity or strength. In respect the table is new matter, but it is not new as to the substance of any of the items which enter into it. Each of those odors which will be found here to be classified for example under sewage odors will be found in its respective place, scattered through the different pages of Exhibit No. 14. Here they are brought together.

Q. In tabulated form?

A. In tabulated form.

Q. By whom were those tables prepared?

A. Prepared by me.

Q. And from work done under the supervision of yourself as a member of the Committee on Harbor Work of the Metropolitan Sewerage Commission during the years 1906 and 1907?

A. Yes.

Mr. O'Sullivan: Now I offer that tabulation in evidence and ask that it be marked Complainants' Exhibit No. 30.

Mr. Riker: The offer is objected to on the ground that it appears to be nothing but a compilation by this witness, with his own interpretation of evidence that has already been offered in the form of an exhibit and which is already in the cause.

The Commissioner: Note the objection of defendants' counsel.

Received and marked Complainants' Exhibit No. 30.

Marked Complainants' Exhibit No. 30.

Mr. O'Sullivan: I would like to withdraw this witness for a few moments.

1316 DANIEL D. JACKSON, a witness called on behalf of Complainants for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. You have already testified previously Doctor Jackson, as to the work which you did for the New York Bay Pollution Commission, did you not?

A. Yes, sir.

Q. Did you have any connection with the subsequent commission that was created, known as the Metropolitan Sewerage Commission?

A. I was Consulting Analyst on that work also.

Q. Are you still the director of the Mount Prospect Laboratory?

A. Yes, sir. As Consulting Analyst I had the supervision of the methods employed for the first Metropolitan Commission.

Q. The methods employed by whom?

A. Employed by the analysts in their laboratory, bacteriological and chemical.

Q. Who was the analyst, chemical analyst?

A. Mr. Miller was the chemist and Dr. Parsons the bacteriologist.

Q. What methods did you prescribe for chemical determinations that are set forth on Complainants' Exhibit No. 14 and Complainants' Exhibit No. 20, which I hand to you?

Mr. Riker: The question is objected to on the ground that it is immaterial what he prescribed, the real question, if it is relevant at all, is what was done, not what was prescribed.

The Commissioner: Note the objection of counsel for defendants.

Mr. O'Sullivan: I withdraw that question for the moment.

Q. What were your full duties as consulting Analyst, state what you did; what you prescribed, and how you knew whether or not your prescribed procedure and methods were followed.

Mr. Riker: I object on the ground that that involves several parts which cannot be answered in one answer, and that in so far
1317 as it embodies the question of what he prescribed, it is entirely immaterial and irrelevant.

The Commissioner: Note the objection.

(Question repeated by the stenographer.)

Mr. O'Sullivan: And also state any check systems that you used on the results of the work being done under your direction as consulting Analyst.

Mr. Riker: The addition to the question is further objected to in that it still involves a further element, the question being multiform.

The Commissioner: Note the objection of counsel for defendants.

A. As consulting analyst I visited the laboratory from time to time and noted the methods which were being employed, saw the analyses under way and consulted with the chemist and bacteriologist regarding the methods. The methods employed were the same—are those made standard by the American Public Health Association, and in the bacteriological work, the tests for bacteria were made on gelatin at the same time, on the same day of collection and the counts being made two days later, as to the number of bacteria. The gelatin was made in the standard method employed by the American Public Health Association, and the results were examined from time to time, as to their appearance, as to whether they appeared to be normal and presented the conditions which were being examined into. The tests for B. Coli were made with lactose bile solution, and that is also a method that has been standardized by the American Public Health Association.

Q. Who is credited with that lactose bile method, either in inventing it or applying it, or recommending it?

Mr. Riker: The question is objected to on the ground that this witness has already testified to that exact question and he has answered that he himself is the one who is responsible for it.

The Commissioner: Note the objection of counsel for de-
1318 fendants.

Q. Proceed, Doctor. I was afraid my friend might forget that.

Mr. Riker: I do not forget little things like that.

A. The method was originally used by me at the Mount Prospect Laboratory, and has since been standardized and has become the standard method for the determination of intestinal organisms in water. This was the same method as was used in the work of Doctor Parsons for the first Metropolitan Commission. The chemical results which were done by Mr. Miller were the determinations of the turbidity and color and chlorine in the water and the color and loss on ignition of the mud samples. The methods employed for the chemical examination for the loss on ignition, turbidity, they are also standard methods. The turbidity was determined by means of the silica standard, which was used in bottles made up for comparison in parts per million of standard diatomaceous material and the figures in turbidity represent the parts per million of suspended matter in a general way. The color was obtained by comparison with the color standard known as the Hazen Color standard, made of platinum and cobalt solution, which is also a standard method. The loss on ignition was determined by igniting the dried mud at a low red heat, to drive off the volatile matter, and represents, in a general way, the amount of organic matter present in the mud. The chlorine was determined by the silver nitrate method, which is standard, and conceded to be accurate, and these results showed the relative proportion of fresh and salt water at the points located in the harbor. The relative amounts of B. Coli and bacteria show, in a general way, the extent of pollution at the various points, and the amount of bacterial action which is taking place at those points. The turbidity is a measure of the degree of turbid matter of suspended matter, which occurs in the water and is used to determine the zone of influence of a discharge of sewage. In waters
1319 which are comparatively clear as the Hudson River and the Upper Bay, a greater portion of the time the degree of turbidity shows the relative amount of sewage influence at those points. The sewage in such cases being much more turbid than the water itself. In some waters where the turbidity is due to heavy suspended clay, the same determination is made, and the relative degree is taken in the opposite direction, because a highly turbid water will have more turbidity than the water itself, and in that way the lowness of the turbidity will give the zone of influence. These turbidity readings are taken for that purpose to get the zone of influence of the sewage, and the track covered by it, the relative area which is affected by the flowing sewage along the surface of the water. This, in connection with the salinity, gives an idea of the relative degree of dilution which the sewage is getting at the points examined. This degree of dilution, of course, is different in different portions of the harbor, due to a lack of uniform distribution between the sewage and the harbor waters, so that locally the conditions are much worse at certain points than they are in others.

Q. Have you described, Doctor, the method used in determining the putrescibility of the mud samples?

A. No material amount of work was done at this time in my recollection upon the putrescibility of the mud. The mud samples

were putrescible in almost every case, but the actual degree of putrescibility obtained—that was not carried out to any great extent.

Q. What is the test for putrescibility which you employed?

Mr. Riker: I object to the question on the ground that the witness says he did not employ any test.

The Commissioner: Note the objection.

A. I said that not very much work was done on the relative degree of putrescibility at this time.

Q. Well, what was actually done, what methods were employed, actually, in determining the putrescibility in such work as
1320 was done?

A. The samples of mud were placed in water and allowed to stand and the odor was obtained, for a definite period, but the amount of dilution, the exact amount of dilution, which would be obtained by the relative pollution, was not taken to a large extent. The odor of the mud itself was taken at the time of collection, and the extent of the odor on standing in closed bottles, but the actual degree of dilution required to produce the odor, to lose sight of the odor, rather was not at this time taken, according to my recollection.

Q. Then the methods were quantitative rather than qualitative?

A. The methods were qualitative, not quantitative.

Q. Was the methylene blue method employed?

A. I am not certain about that. The methylene blue gives a sharp test between the water which is putrescible, and the water which is not putrescible. And this point is also, and used to be obtained by taking the odors rather than the disappearance of the color. It was just about this time that the methylene blue method was discovered.

Q. Is the ignition test that you have described one which was followed by the two gentlemen on the stand—what signification did you attach to the presence of the organic matter which you said was driven off by the heat, on the general question of harbor pollution.

A. The loss on ignition gives the amount, in a general way, the amount of organic matter present in the sewage. It does not differentiate between the kinds of organic matter. It is simply organic deposit.

Q. And with the test for the B. Coli and for the bacteria, the intestinal bacteria, the inference was what?

A. That the deposit was at least partially of sewage character. It could not be determined by the actual loss on ignition
1321 that all of it was sewage. It could be determined that a certain proportion of it was sewage.

Q. How did these mud examinations under your consultative guidance have any relation to the question of pollution as a whole?

A. The relative amount of organic deposits in the bottom of the harbor, as represented by the loss on ignition, shows in a general way the relative degree of putrescibility which takes place in the mud. If the percentage of organic matter is high, there is a very considerable amount of oxygen used up by the mud itself in

the bottom of the harbor, and septic conditions are going on there. The sewage in the water is assisting to detract from the dissolved oxygen in the water. The deposit of mud, organic matter, the relative degree of organic matter in it, gives a general line on that proposition.

Q. How often about did you consult with Mr. P. Schuyler Miller and Dr. Payn B. Parsons during the progress of their work under your consultative guidance?

A. About once a week. I visited the laboratory and discussed the determinations and results with them.

Q. Did Mr. Miller do any of the work in your laboratory, make any of the examination there?

A. On one or two occasions he did.

Q. Under your direction?

A. Yes, sir.

Mr. O'Sullivan: Your witness.

Cross-examination by Mr. Riker:

Q. Doctor, does the test of the loss by ignition of mud indicate whether organic matter driven off is of vegetable or animal origin?

A. No, sir.

Q. How then does the loss by ignition shown on any of the samples which were taken under your observation indicate sewage pollution?

A. It indicates the amount of putrescible matter in the bottom of the harbor.

Q. Which may be of other origin than sewage?

1322 A. For that test alone, it does not give it exactly.

Q. It does not distinguish at all as to the source of the organic matter driven off?

A. No, sir.

Q. Does the bacterial test in itself indicate pollution in any other sense than that there is foreign matter present in the water?

A. It does.

Q. It indicates contamination?

A. Of intestinal origin, from warmblooded animals.

Q. The bacterial test indicates that?

A. B. Coli tests, yes.

Q. I did not ask you that. I asked you about the baterial test?

A. That is part of the bacterial test.

Q. The general bacterial count, does that indicate pollution in any other sense than in the presence of organic bodies in the water?

A. Organic matter available for bacterial growth which is dead organic matter.

Q. Do you know what the standard of milk purity is, with reference to the bacterial count?

A. It has been changed so many times, I could not give you the exact figures at the present time.

Q. Is 500,000 per cubic centimeter excessive?

A. That is about it. It is different in different states.

Q. It is about one million here, isn't it?

A. I cannot say. I am not a milk expert.

Q. So that the presence of bacteria in water in large numbers does not of itself render the liquid unfit for human use?

A. The test for bacteria is not made for that purpose. It is made to test the amount of organic matter which is going in. Under those circumstances you might say that sewage itself was not unfit for human use.

Q. So far as the bacterial tests of the water, which is supposed to give the bacterial count of the water, it does not necessarily indicate sewage, does it?

A. The bacterial count does not necessarily indicate sewage, no.

1323 Q. So that your bacterial count shown by your tests, of itself, does not indicate sewage?

A. It indicates the relative degree of organic matter which is present, and we know what the nature of the organic matter is, which is in the harbor. Consequently we conclude that it is to a large extent sewage.

Q. Are you familiar with the tests for bacteria in the potable waters of New York City?

A. I am.

Q. Do you know whether the waters the potable waters of New York City contain bacteria?

A. They do, as all potable waters.

Q. As all sorts of potable waters do?

A. Yes, and practically all ground waters as well.

Q. Do the deep well waters contain bacteria?

A. Some bacteria as a rule.

Q. Have you in mind any of the counts on the water supply of New York City?

A. I have.

Q. Is the number of two thousand bacteria in the standard unit unusual in the water supply of New York City?

A. It is.

Q. Is fifteen hundred?

A. It is.

Q. Do you know of any instances where they have run as high as 1058?

A. Yes, many times.

Q. Well, do you know whether tests for the B. Coli in the potable waters of New York City have disclosed the presence of B. Coli in them?

A. Well——

Q. Whether they show a positive reaction for B. Coli?

A. Any surface water will show positive action for B. Coli if you take a large enough amount to show the result. This is a quantative result, not a qualitative one.

Q. The harbor waters are not to your knowledge used for potable purposes?

A. Certainly not.

Q. How many actual analyses of the samples of water were made under your immediate observation and the results noted by you?

A. That I could not say. I was there at the laboratory
1324 occasionally and saw the plates and made occasional checks. I was not there during the making of the analyses, simply to check up the work and see that it was in accordance with standards.

Q. And the work so far as you saw it done, was in accordance with recognized standard methods?

A. It was.

Q. Is the test of loss by ignition a recognized standard method?

A. So far as water analysis is concerned it is.

Q. What?

A. The loss on ignition of mud is purely a test for the organic matter, just as you have the loss on ignition on anything else. There are no standards. Nobody has made a standard for mud.

Q. So that all those tests indicate is that there were bacteria in the mud, that is all, that there was organic matter?

A. Yes, the relative percentages of organic matter in the mud were shown in the tests.

Q. Do you say there was any standard to which these results could be subjected?

A. There have been no standard determinations for mud made by any organization that I know of, having been no occasion for it as yet.

Q. Have you ever tested or had under your observation any test of the mud from the bottom of the river which was not putrescible, which did not show putrescibility?

A. I have.

Q. Where?

A. I have examined mud from the bottom of various uncontaminated reservoirs, and at times they are not putrescible. At other times they are. The putrescibility test should be made on dilutions and made quantatively. The degree of putrescibility is a matter which has to be determined.

Q. Does the presence of organic matter, of purely vegetable origin never having passed through an animal body, render the mud putrescible?

A. At times. Anything which will set up a high degree of bacterial action will cause putrescibility.

Mr. Riker: That is all.

1325 Redirect examination by Mr. O'Sullivan:

Q. Mr. Riker asked you some questions relative to bacteria in milk, desiring you to compare it with the bacterial conditions of water. Will you explain what differences there are in the two fluids, and why bacteria are found in each?

A. The bacteria which are found in water are the bacteria which got into the water. In other words, as a rule, there is no increase in the amount of bacteria in the water unless the water is highly con-

taminated. The bacteria which get into milk increase enormously particularly if the milk is allowed to warm up in the least, and the standard naturally for the number of bacteria in milk is enormously high. In the case of the water the bacteria do not increase as a rule in the water. In the case of the milk they do increase enormously, on account of the amount of organic pabulum available for their growth. Therefore there is no comparison at all between the two either in the matter of numbers or the matter of standards.

Q. Do you regard milk as a culture medium, or media?

A. We use it as such for bacterial work.

Q. What do you mean by culture medium?

A. A medium in which bacteria are grown for the purpose of determining their relative appearance or the relative reaction which they produce. In that way we are able to distinguish the various species which occur in water. And milk is one of the fluids which is used for the determination of these various species.

Q. Do they multiply sufficiently fast in milk to determine their character and presence by their morphological appearance?

A. No, sir. The morphological appearance is not obtained by a liquid medium. That general characteristic is obtained on solid matter. The milk is rendered sour or alkaline, or it coagulates or becomes stringy, or has various different appearances, according to the species which is being determined in the milk. It is a
1326 test which is physical and chemical, but not morphological. The morphological features are determined under the microscope and through the growth on a solid medium.

Q. Was the bacterial count supplemented in the direction of work in determining the intestinal bacteria apart from the mere count?

A. It was. In the test of water or sewage the two are always made together.

Q. They are separate and distinct?

A. Entirely so as tests, but they are considered together in the interpretation of those tests.

Q. So that when you get a bacterial count and positive reaction for B. Coli, and the presence of organic matter is determined by loss on ignition, what do you regard the condition as?

A. Regard the presence in quantity of B. Coli as representing sewage contamination; the number of bacteria as representing the bacterial action which is going on in consequence of this contamination, and the loss on ignition as representing the relative amount of bacterial action which is available in the mud.

Q. Adding the chemist's determination to that, does it aid you in classifying the action or in arriving at the class of action of the bacteria as to whether they are aerobic or anaerobic?

A. It does. The degree of putrescibility, or the fact that the mud itself is putrescible shows that anaerobic action is going on in the mud, and the percentage of the organic matter would give in a way the amount of organic action which would be going on, so that the chemical results taken together with the putrescibility and the bacterial figures give a line on the general conditions at the locality examined. No one test in water analysis or in sewage analysis is

taken as a criterion for the conditions which may exist at that point. The entire series of tests should be examined and
1327 the interpretation made from them.

Q. And for the purpose of getting at that interpretation is it helpful to tabulate the various findings of the bacteriologist and the chemist, as set forth in the Complainants' Exhibit before you?

A. It certainly is. It is necessary of course to get the various figures together for the purpose of relative comparison. To show the different degrees of pollution which exist in the various portions of the harbor, and to get a general line on the actual amount which occurs in those various portions. As, for instance, in certain portions of the harbor, I note there are bacteria running as high as 25 million per cubic centimeter.

Q. What exhibit are you consulting now?

A. Complainants' Exhibit No. 14.

Q. On what page?

A. Page 11. I note an instance where the bacteria in various portions of the harbor, as at Washington Avenue and Wallabout Creek, and in Wallabout Bay, that the bacteria run as high as 25 million per cubic centimeter. That shows the relative degree of bacterial action which is going on at that point. At other portions of the harbor the figures run much lower. That bacterial action of course is dependent on the amount of organic matter which is present and available for bacterial action, and the temperature conditions which assist in such action.

Q. Look at that other exhibit, Doctor, please, in front of you, what number is that?

A. That is Complainants' Exhibit No. 20.

Q. Taking the chlorine column on any of the pages as set forth in that exhibit, does the question of fresh, sale or brackish waters, as indicated by the chlorine determinations have any relation to the capacity of the harbor waters to digest sewage?

A. They represent in themselves the amount of dilution
1328 which the fresh water coming down from the Metropolitan water Shed is being mixed with the salt water which is coming in through the East River and through the Narrows. The chlorine results vary here. For instance, in Spuyten Duyvil, I note on page 11 of Complainants' Exhibit No. 20, that the chlorine results are 2800, whereas in the East River on the same page the results are 14,000. That represents the relative degree of dilution between the fresh and salt water. That is, all the fresh water which is going in from that drainage area, including the sewage and the degree of dilution which that fresh water has had with the salt water coming in from the Narrows and from the East River.

Mr. O'Sullivan: I think that is all.

Recross-examination by Mr. Riker:

Q. You do not condemn for use as potable water, water which shows bacteria on a bacterial count, do you?

A. How many bacteria?

Q. Any?

A. Certainly not.

Q. You do not condemn for use as potable water, waters which show positive tests for B. Coli, do you?

A. Not when they occur in very small numbers, and when they are surface waters.

Mr. Riker: That is all.

Redirect examination by Mr. O'Sullivan:

Q. The presence of bacteria in potable water have to be in what numbers before you condemn it?

A. That would depend upon the conditions. If it was well water, it would be entirely different from what it would be for surface water. The relative relationship which the water bears to the water shed, whether or not it is well water or surface water entirely which might be contaminated. In a surface water, what the material of the water shed was which produced this bacterial action.

In other words, there is no such specific numbers by which we
1329 could condemn the water. We condemn a water from the entire analysis, and usually from an inspection of the conditions surrounding that water, by which we could interpret the analysis.

Q. Do you regard the term "bacteria" as a very generic one, including those that are beneficial and those that are malignant?

A. Entirely so, yes. It includes all the bacteria present.

Q. And what percentage of B. Coli would you regard as dangerous in potable water?

A. Anything beyond the 10 c. c. dilution, is considered suspicious. We would then make an inspection of the supply, and if the B. Coli occurred in any large number, we would condemn the supply. If it occurred in well waters, and in the ten cubic centimeter dilution, you would make an inspection to see that it did not come from actual human contamination.

Q. And that applies to the whole group of intestinal bacteria?

A. Yes, sir.

Q. Doctor, you have used the terms of the percentages in cubic centimeter dilutions. Will you explain those three that are usually in use, and what those dilutions mean in reference to the B. Coli?

A. When we speak of the one tenth cubic centimeter dilution, we mean that one tenth of a cubic centimeter is placed in a liquid medium and allowed to grow, thereby indicating the presence of intestinal germs in this liquid by the gas that is given off by the intestinal organisms. When we speak of the one cubic centimeter dilution, we mean that one cubic centimeter was employed for this test. The same applies to the 10 cubic centimeter dilution that ten cubic centimeters were used, and incubated to determine whether intestinal germs were present in that quantity.

Q. Did you say ten or one tenth?

A. One tenth, one and ten were used in these tests. In other

words in the ten cubic centimeters the amount a positive test shows was in a general way one hundred times as much as in the
1330 one tenth cubic centimeter. In other words, in a general way, it is a quantity test for the amount of B. Coli present.

Recross-examination by Mr. Riker:

Q. Doctor, you said I think that if you found its presence in the ten cubic centimeters you considered — a matter of suspicion?
A. In a well water, yes.
Q. In surface potable waters, do you consider it so?
A. I should want to inspect, but we usually take the one cubic centimeter in the surface water.
Q. The presence of that particular bacillus is indicated by fermentation, is it not?
A. Yes, sir.
Q. And if a positive test, by fermentation, is obtained from on cubic centimeter, would you consider that a subject for serious suspicion?
A. In a surface water?
Q. In a surface water?
A. I should expect to see what the source of the Coli was.
Q. Do you happen to be familiar with Newark's water supply?
A. No, sir.
Q. You do not know anything about it?
A. No, sir.
Q. You do not know how it ranks?
A. No.

Mr. O'Sullivan: It ranks with the rankest.
Mr. Riker: It is one of the best.

The Witness: Most every water supply is the best according to the people who live there.
Q. You do not know whether the tests for this particular bacillus has been positive in that water or not?
A. I do not.
Q. Do you know whether it has been positive in the New York water supply?
A. Occasionally.
Q. Generally, have they not?
A. No, sir. I mean when I say positive, I am speaking of the one cubic centimeter. I am speaking quantitatively always.
Q. Do you know what percentage *have* been shown to be present in that test speaking quantitatively as you insist upon doing?
1331 A. What do you mean by the percentage, percentage of what?
Q. What percentage of the numbers examined; you keep a record, don't you in this State?
A. Yes.
Q. Can you give any percentage of the positive results on that test in your New York water supplies?

A. I suppose you realize that there are a hundred different water supplies that are supplying New York. We examine streams and ponds and reservoirs and there are some of them which are contaminated, and some of them which are not.

Q. Some are contaminated and some are not, and those that are contaminated are still being used for water supply?

A. They are, after long storage.

Mr. Riker: That is all.

At 1 P. M. adjourned for noon recess until 2 P. M. when the hearing will be continued at the Corporation Counsel's office.

1332 Afternoon Session, 2 p. m.

CORPORATION COUNSEL'S OFFICE,
December 29th, 1911.

OLIN H. LANDRETH, a witness called on behalf of Complainants recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan (continued):

Q. Did any of the testimony that you have given these two days, Professor Landreth, relate to work done at other times than the years 1906 and 1907?

A. No, sir.

Q. When you were on the stand previously, did any of the testimony which you gave on direct examination relate to other work than that done between the years 1903 and 1905?

A. No, sir, the testimony given at that time related entirely to this work of the New York Bay Pollution Commission, whose term of existence covered the years 1903 to 1905.

Q. Both inclusive.

A. Yes, all of 1905 inclusive, whereas all the testimony I have given at this hearing yesterday and today relates to the work of the Metropolitan Sewerage Commission of New York, whose duration extended from November of 1906 to the end of 1907.

Q. When it was reorganized?

A. When it was reorganized.

Mr. Sullivan: Your witness, Mr. Riker.

Cross-examination by Mr. Riker:

Q. Your conclusion as to the unfitness of the harbor water for street sprinkling is firmly fixed in your mind, is it?

A. Yes.

Q. You believe that the water is unfit for that use?

A. I believe it would be unsafe to use it for that purpose.

Q. So that the additional pollution of the waters of the harbor will not affect that problem at all, will it?

A. It will increase the risk and danger, if it should be used.

Q. It is not as a matter of fact used now, is it?

A. No, sir.

1333 Q. And it is now unfit to be used, in your opinion?

A. I say it is unsafe to use it, by that I have in mind this fact: there are certain places where safe water might be selected, but the risk that other points might be used and other water taken than that which is safe, renders the entire proposition unsafe.

Q. And it is unsafe, is it, in your opinion, unsafe for use?

A. Yes, and to further pollute it would simply tend to increase the danger if it were used.

Q. You make a distinction in the degree of unfitness, do you?

A. Yes.

Q. With reference to the float observations, were you present when any of them were made?

A. Yes, sir.

Q. How many of them?

A. Perhaps three, four or five.

Q. Over what period of time did the longest of these float observations extend, insofar as you were concerned?

A. Well, I think perhaps the longest time in which I saw a float in the water at one time was possibly two hours.

Q. So far as you know did any of the float observations extend beyond one tide?

A. Most of them extended past the turn of the tide.

Q. Do you think that is a sufficient observation for the purpose of determining the movement of harbor waters?

A. It is a sufficient basis on which to determine what a tide does, and if we have sufficient determinations of single tides by placing them together, they give us a fair indication of what will happen with successive tides. We did not however make any observations ourselves to cover—which covered two whole tides.

Q. Either a continuous observation of the same float or by putting the float into the water at the same point on the next tide?

A. Yes, we did that.

Q. Did you, where?

A. From a point I have in mind, from the proposed site
1334 of the outlet of the Passaic Valley Sewer, or at or near Robbins Reef Light.

Q. First the tide took it where—these were under your observation?

A. I was not personally present at that time, no, sir.

Q. How many of the observations, if you know, were there, float observations?

A. I think about between 25 and 30 in all.

(Witness refers to exhibit.)

A. 27 I think.

Q. What is the weight of the float that was used, that was used in any of these observations?

A. The dead weight out of water?

Q. The dead weight?

A. I cannot answer that.

Q. What was the height of the vanes there were used in these floats, or in this float?

A. They were approximately a foot and a half in height, from a foot and a half in height——

Q. And what was the depth of the bottom of the float from the surface of the water, or the average?

A. Somewhere around 5 or 6 feet, between 5 and 6 feet.

Q. Do you think that the action of the float as described and of the dimensions that you now state, is an indication of what the course of the surface waters may be, particles on the surface of the water?

A. No, it does not accurately indicate the precise motion of particles on the surface, or particles ten feet deep, but it does indicate the average motion of the upper sheet of water from nothing to 10 feet in depth.

Q. Why do you say 10 feet?

A. Because in taking a depth such as that, the center of the float represents the center of that depth. The center of the float was about 5 feet and the center of the float represents fairly well the path taken by the average particle in a sheet of water of 10 feet deep.

Q. Does it furnish conclusive proof of anything except
1335 the actual direction and course of the float itself under the actual conditions in which it was in the water?

A. No, sir.

Q. Does it give you any fact which would serve to determine what would be the disposition of sewage discharged at a depth of 40 feet at about Robbins Reef?

A. Yes, in conjunction with our knowledge of what will happen to the sewage when it is discharged.

Q. What do you assume will happen to the sewage when it is so discharged?

A. It will rise to the surface or near the surface in large measure and when it does it will occupy the plane of the water which it was the purpose of these float observations to study, the motion of the upper stratum of water.

Q. And can you state from your knowledge of any fact or facts, what proportion of sewage discharged at that point which will rise to within 10 feet of the surface?

A. My observation has been on sewer outlets, that a very large percentage of the sewage will rise to within 10 feet of the surface.

Q. What sewer observations do you refer to now, when you say your observations of sewage?

A. I refer to the out falls of sewers around New York, and the out falls of sewers in Boston Harbor.

Q. What else?

A. The outfalls of the sewer at Philadelphia, the outfall of the sewer at Providence; the outfall of the large sewer at Memphis; the outfall of several large sewers at Nashville, Tennessee under high water depth and a good many others.

Q. Which one of them discharges horizontally at a depth of 40 feet below the surface?

A. Not many of them discharge horizontally. Most of them—a portion discharge horizontally, and a portion have outlets that send them upward.

Q. And what one of them discharges at a depth anything like 40 feet?

A. Well, the Memphis Sewer, the Nashville sewer, both.

1336 I observed the discharges under depths as much as 40 feet and at times even higher than that.

Q. What was the condition of the rivers at that time?

A. The condition of the river was at flood stage, but in the case of Nashville, it was a point of discharge in such a place that it does not get the full velocity of the current. It is slack water where the sewer discharges.

Q. What was the condition as to the turbidity of the water?

A. The water was turbid; the river water was turbid.

Q. Can you state what percentage of the sewage reached the surface from your observation of the Memphis sewer and the other one that you have spoken of?

A. My estimate, without having measured it, would be that upward of eight-tenths, perhaps nine-tenths of the sewage came to the surface.

Q. On what do you base that estimate?

A. I base that knowledge on the form of the boil, or the stream of sewage as it flows up more than I do on any relative measure of the parts which comes to the surface as compared with the parts that do not.

Q. Did you use any instruments in measuring?

A. I did not.

Q. You simply rely upon your observation, your eye of the conditions on the surface as you saw them?

A. Yes.

Q. Where do the sewers of New York discharge?

A. They discharge at—some of them at the bulkhead and some at the pierhead lines.

Q. With reference to the surface of the water?

A. At various depths, varying from nothing at the upper end—upper edge of the sewer to 5 or 6 feet in others.

Q. They discharge practically on the surface, do they not?

A. Near the surface, yes.

Q. Is it not a fact that float observations are now recognized to be practically worthless for determining the courses of the

1337 waters of a harbor?

A. They are, if they are not properly made.

Q. You testified that there were two elements as I recall it, which entered into the course of your floats, as observed, one being the wind, the air pressure, and the other being the tide. Are there any other elements which entered into the determination of the direction of the floats?

A. Yes, minor disturbances, such as those due to the weight of

vessels, but they are negligible, considering along the whole path of a whole tide.

Q. Do the discharges of the fresh waters of the Hudson River affect the floats in New York Bay?

A. Yes, but that is a part of the thing that was sought to be observed.

Q. Is that part of the tide?

A. Yes, part of the resultant tide.

Q. The route of the water from the Hudson River, that is the result of the tide?

A. The resultant tide.

Q. Do currents in the bay have anything to do with the course of the floats?

A. Yes, wherever there are such local currents they have something to do with it.

Q. There are more than two elements at least?

A. Well, those currents are direct parts of the tidal influence.

Q. To what point, with reference to the surface is the under run effective upon the waters of the harbor?

A. I do not know as I quite understand what is meant by the word "effective." I will try to answer it.

Mr. Riker: Strike the question out as the witness does not seem to understand it.

Q. At what depth is the effect of the underrun perceptible?

A. Well, the underrun changes in its depth according to the time after the change of tide. Immediately following the change of tide, the underrun begins, extends at the bottom and gradually rises toward the top, and as it rises it tends to diffuse the
1338 two sheets of water, the incoming and the outgoing water, or the incoming and the quiescent water, and ultimately they become merged, and a common motion finally ensues in the direction of the new tide, so that the question as to the depth will have to be answered by the answer that the depth varies, beginning at the bottom and gradually rising towards the top, and as it rises fading out in indefiniteness.

Q. You have testified that the observations of the determinations of salinity on the samples of water submitted were useful in determining the underrun, have you not?

A. Substantially that, yes, sir.

Q. Now, how are the determinations of salinity of any value in determining the underrun, and what feature of the underrun does that determine or help to determine?

A. They are helpful in determining the presence of the underrun, by taking account of the differences in the salinity of the waters, in the two parts of the depth, in two parts of the flowing current.

Q. What do you understand to be the underrun?

A. By underrun, I mean the wedge of salt water which starts into the harbor after the turn of the ebb tide, and just as the flood tide begins, being perceptible first on the bottom and gradually extending in influence up through the depth and ultimately reaching the

That distinction between the two currents is more marked
case of deep and usually narrow channels, that is in a case
there is a body, a sheet of water of shallow depth, as in the
f the water over the bar.
Is it anything different in general character from the under-
the surf?
Well, it comes from quite distinctly different causes.
I did not ask you that?
A. Yes, it is different. In the case of the undertow in
the surf, the motion of the current there is largely parallel
with the shore, parallel to the shore and partially off the
whereas the incoming surf is approximately at right angles
ne shore. In the case of the underrun, however, the two cur-
re almost entirely opposite in their direction.
What other causes affect the salinity of the water in New
Harbor and the underrun?
Well, the salinity is affected by only one cause, and that is
esence of salt. If you mean in what measure is the solution
l, then I will say the effect also by the inflow of land water,
And depends in the main upon the amount of land water
being poured down the Hudson River?
That is one important point, yes, sir.
And that is the most important upon the question of the
un?
I do not know that I can make a comparison as to import-
etween the two. As to the volume a relative volumetric com-
, that depends entirely—largely at least—on the time of the
hen you are making the observation. If your remarks relate
time of freshet in the Hudson, I should say that the influence
fresh water discharging on the dilution of salt water was
in volume than the underrun at any one point at that same
hows it, but if you select a period dry flow, when the dis-
of the Hudson is only a small section of what it is at freshet
hen I should say that the—that perhaps at many points the
un might exceed in volumetric influence the fresh water
uted by the Hudson.
When is the effect of the flow of fresh water from the Hudson
most perceptibly felt in New York Bay in the reduction of
linity of the waters?
At the time of spring freshets in the Hudson.
And what part of the day?
And towards the end of the ebbtide.
Q. So that towards the end of the ebb tide you will expect
to find at any given point in the harbor a less amount of
salinity in the water?
Yes, sir.
Which has the greatest specific gravity, fresh water or salt
Salt water.
And does the specific gravity increase as the salinity increases?
Yes, sir.

Q. So that you will expect to find the salter waters at the bottom of the harbor, would you not.

A. Yes.

Q. You did find it so?

A. Until it became thoroughly diffused.

Q. You did find it so?

A. We do, when the change is being made, when they are kept separate, as occurs in the case of turn of the tide.

Q. Why do not you answer yes or no?

A. Because it is not always so.

Q. At what depth does it not always appear so?

A. It is not so much a question or depth as it is a question of opportunity for thorough diffusion or mixing of two kinds of water.

Q. What is the opportunity for the mixing of the two kinds of waters to which you refer as affecting this problem?

A. Shallowness of channel contributes to that facility, also the length,—the distance that the waters have had an opportunity to run before *the coming* commingled. The presence of projections in the topography of the harbor, projecting obstacles or objects, which tend to cause obstructions and thereby to cause mixture. All those are agencies that tend to encourage the diffusion of the salt and fresh waters together.

Q. Which one of them is not dependent upon the depth of the water for its operation?

A. I mentioned the shallowness of water as being one of the things that contribute to a ready diffusion.

Q. Well, which one is not dependent on that shallowness, as a matter of fact, for its operation at all?

1341 A. I do not think I understand the question.

Q. Which kind of water, fresh or salt, has the largest digestive capacity for sewage?

A. Fresh.

Q. Why?

A. Because the bacterial activity in fresh water is greater than it is in salt water. That is to say the bacterial activity, the activity of those varieties of bacteria which in their operation reduce organic matter.

Q. Why are they more present in fresh water than in salt water?

A. I would not attempt to say why they are more present. Their activity is greater. I would not attempt to say why.

Q. You would not be willing to say that it was due to the greater percentage of free oxygen in fresh water?

A. Even with the same percentage of oxygen the activity is greater in fresh than in salt.

Q. As a general proposition is it not a fact that the greater digestive capacity of fresh water is due to the amount of free oxygen in it?

A. I do not think so at all. I do not think as a whole.

Q. You testified in answer to a question yesterday that fresh water passing into brackish had less digestive capacity for sewage than the unmixed waters?

A. Yes.

Q. Do you mean that it has less than the salt water that forms part of the admixture?

A. Yes.

Q. Less than that?

A. Yes.

Q. So that the mixing of a large capacity with a less produces less capacity than the least?

A. Just that, yes, sir.

Q. Where do you get your authority for that statement?

A. I get the authority for that from several bacteriologists who have experimented with the numbers and the rates of increase of bacteria in fresh water, in salt water and in waters which are changed from salt to fresh.

Q. Who are those authorities can you name them?

1342 A. Well, I should have to refer specifically to that in order to get the names. I would not attempt to give the names precisely.

Q. Have you ever experimented yourself on that?

A. No, sir, I have not, no.

Q. You made certain shore observations yourself in connection with your work as a member of this commission. How many of these did you make personally?

A. I made shore inspections as I stated, I think, on my direct examination, along the shores of Brooklyn, from substantially—from Blackwell's Island almost continuously to Coney Island. Shores that is on the Brooklyn side of the East River. On the Manhattan side of the East River 24th Street to the mouth of the Harlem River, then along the Harlem River through practically all its length, and on the Manhattan Side of the North River from Battery Place to the mouth of the Harlem at many points, not at all points. I visited perhaps three quarters of all the docks and piers within that region, also a number of points on the Jersey side. Hoboken, Jersey City, Communipaw, Bergen, Bayonne, and on the Newark Bay side of the Isthmus, at two or three points, besides trips in the Bay, which I am not now mentioning.

Q. Now, confining myself to your examination on the Manhattan shore of the East River, you observed certain phenomena in connection with the marine growths, as I remember?

A. Yes, sir.

Q. Where are the mouths of the sewers discharging along that shore front, with reference to the surface of the water, if you observed them or any of them?

A. Yes. They are not very deep below the surface. In some cases they are exposed at low water. In other cases they are three or four feet in depth, and small sewers even deeper depths than that.

Q. And with reference to the bulkhead line or the pierhead line, where are these sewers located?

1343 A. On the East River, a larger portion I think, are discharged at the bulkhead line than at the pierhead line,

whereas on the North River the larger portion of the sewers extend through to the pierhead line.

Q. I am asking you to confine your attention to the East River?

A. On the East River, I think perhaps a majority of the sewers stop at the bulkhead line, or are inside of the docks, not very far out in the slip.

Q. Did you observe the character of the discharge of those sewers as to whether it had been treated in any way?

A. I observed the character of the discharge of the sewers in many cases.

Q. Did you indicate any of them as having been treated, purified in any way?

A. No.

Q. Is it what in my loose language might be called crude sewage?

A. Yes, crude sewage.

Q. That discharges at the surface along the bulkhead lines, and you found it affecting water life, marine vegetation and you found scum on the surface of the water, did you not?

A. Yes I say to most of those questions.

Q. Well, on the Brooklyn shore, the scene of your inspections were the same conditions present with reference to the discharge of sewage?

A. Yes, with the exception I think, that a rather larger proportion of the large sewers are carried out to the bulkhead line.

Q. To the pierhead line?

A. To the pierhead line, I should say.

Q. And on the Manhattan shore of the North River, or the Hudson River, did you find the same conditions with the exception of the discharge point at the pierhead line?

A. Substantially. I think the depths of the outlets are perhaps a little deeper on the North River than on the East River side.

Q. So that the Greater City of New York is discharging its sewage at the surface right along its shore front, is it not?

1344 A. Yes.

Q. And in that way is affecting the shore front in the way described?

A. Yes.

Q. Now, with reference to the observations on the bar, when was it that you made those observations?

A. In the summer of 1907.

Q. And on how many occasions did you make personal inspections of the conditions developed or disclosed there?

A. I was over to that bar several times during that summer. I visited the dredging operations only on one occasion on the boat and another occasion near the dredging boat.

Q. Now what personal observation or determination did you make on the occasion when you were on the boat with reference to the material dredged from the bar?

A. I took careful note of the depth at which it was taken, and careful observation as to the character of the dredged material, as it came up.

Q. What was the depth at which it was taken?

A. I followed the operation during a whole swing of the boat, from the depth of perhaps 15 feet to a depth of 30 feet—35 feet.

Q. Was the material dredged from the same point on the bar during that period, or did the dredge move?

A. The dredge was operating at the same general location. It was moving from the deeper portion where the channel was already started out to the side where it had not yet extended. I saw the dredge in operation at two different times. That is to say, in the interim it had been sent out to sea to discharge its load. They were seagoing dredges and carried their own burden. They carry it out to sea and then they return and dredge up another load.

Q. Did you take any samples of the materials dredged?

A. Yes, sir.

Q. And you subjected it to chemical or other tests?

1345 A. I did not myself, but some of the material taken on the same day was subjected to chemical tests. My own samples were subjected to microscopical tests.

Q. How large a sample did you take?

A. I took a sample of perhaps two or three ounces.

Q. Do you know where it had actually been taken from with reference to the surface of the bar?

A. It was taken when the dredge was operated in rather shallow water, I should say not to exceed 20 feet.

Q. With reference to the surface of the bar itself do you know whether it was surface material or material from a depth in the bar?

A. This was on the inner face of the bar and I think not very far from the crest of the bar. Must have been pretty well up on the bar.

Q. And very near the surface of the bar, so far as you could tell, was it not?

A. They were cutting into the bar, a considerable depth, I could not say just how far.

Q. Can you state the cubical contents of the bar in any rough way?

A. Not off hand.

Q. You do not mean to be understood as saying that the bar consists of sewage matter, do you?

A. No, I said yesterday distinctly that it did not.

Q. Does or does not the presence of sewage indicate to your mind that sewage matter has been carried down to that point from the harbor?

A. You mean the presence of sewage matter discovered at that point?

Q. Yes.

A. I assume of course that the sewage came from the harbor and had been moving down to that point.

Q. So that sewage that had been in the harbor had been carried down by some agency, currents or otherwise, as far as this bar which is off Coney Island, as I understand it?

A. I assume that to be the case, yes, sir.

Q. You made some other assumptions as to how it was carried down, at what point in the water, did you not yesterday?

1346 A. I made some explanations as to the various ways, the various agencies which might have helped to move it there.

Q. Now at what point in the waters of the harbor is it your judgment that the sewage matter was carried down on the surface or at the bottom, or somewhere in between the two?

A. My idea is that that matter which was discovered there was carried there, at least during the latter part of its history by moving on the bottom, being swung back and forth by the water and by tide influence, gradually moving down on the bottom.

Q. Well, if that was so, why was it not carried over the crest of the bar?

A. For the reason which I explained yesterday that that movement takes place only when the motion of the sludge is down stream and it has no hill complement. It is not capable of climbing a hill, and the bar presents a hill up which the sewage was unable to move. That phenomena is observed frequently in reservoir bottoms, also in river bottoms where sludge travels until it meets an obstacle and then stops behind the obstacle. In some cases it climbs up on it, but there is always some portion remaining obstructed by the obstacle.

Q. At what point on the obstacles in your opinion is it stopped so it does not proceed any further?

—. It is stopped by meeting the steep declivity of the inshore side of the bar, namely, the ascending slope of the bar.

Q. So that you would not expect to find this sludge anywhere than at the bottom of the slope of the bar?

A. At the bottom of the slope of the bar, and on the up stream slope. As a matter of fact the soundings and the Ambrose Channel observations show that this sewage is deposited at the bottom, deposited at a 40 foot depth, and it grows shallower as it approaches the top of the bar, and it fades out to nothing a little before it reaches the top of the bar, showing that little, if anything of it was able to get over the top of the bar.

1347 Q. How much water is there at the top of the bar?

A. At that place there was between 15 and 20 feet, as I recall.

Q. Did you take any samples of the water over the bar?

A. No.

Q. You did not try to find out whether the water at that point was affected by what we have called this morning a focal point of deposit of sludge?

A. That would have been impossible at that time, because the water for a long distance around is rendered very turbid by the dredging operations, so that it would have been impossible to have reached any estimate as to the normal condition of the water.

Q. Have you made any samples at any time of the water over the bar?

A. Our commission has done so. I have not done so personally myself.

Q. Are they indicated in the tables that have been presented so far?

A. Yes, sir.

Q. Do they show the contamination, have you examined them?

A. That depends on the stage of the tide. On an ebb tide they do; on a flood tide they do, but to a less extent.

Q. Did you attempt to determine what proportion of sewage matter is located on ledges on the bar?

A. Except as to the depth of this deposit of sludge that I speak of as having been measured by the engineer, varying in depth from nothing near the top of the bar to 12 feet in thickness at or near the bottom of the Ambrose Channel.

Q. 10 or 12 feet?

A. Yes, and how much thicker than that they reached, I do not know because no dredgings were made of the deeper conditions.

Q. Do you mean to say that 10 to 12 feet of solid sewage matter is found at the bottom of the Ambrose Channel?

A. I explained yesterday that this is not solid. It is in the state of ooze, simply lying on the bottom, semi liquid almost.

1348 Q. What are the other component elements of the ooze if it is not sewage?

A. The ooze contained other things than sewage. I do not wish to be understood as claiming that it is all sewage. I characterized it as being ooze and heavily contaminated. In fact it is largely composed of organic matter, sewage and petroleum waste and apparently some coal tar indications, some garbage, and even some light mineral deposits. There were some indications of cinders and I think broken brick were found in that material.

Q. Did you attempt to account for the presence of cinders and broken brick in the material?

A. No, except that it had been dumped somewhere in the harbor and had found its way to that point. Whether it was moved there with the movement of the ooze, of the sludge, or if it was dropped there initially, I cannot say. Quite possibly the latter.

Q. What do you understand to be the cause of the existence of the bar socalled?

A. I understand that to be the cause of the shoreward complement of the water influence of the ocean, the ocean waters.

Q. Nothing else?

A. Well, yes, in part due to the sedimentation of mineral matters from the fresh waters of the river that comes down, but primarily due to the shoreward movement, being toward the west on the Coney Island shore, and toward the north on the Jersey shore, moving in harmony with the prevailing shore complement of the waste on those two shores.

Q. Is it not caused by a substantial point of rest of the river waters resulting from the diversion, obstructive action of the waves and the current of the river?

A. It is in part, but only in part. The examination of the material of the bar itself shows that it is not largely due to that. If it

were the material of the bar would be shown to be nothing but river silt, whereas the material of the bar is quite largely sand,
1349 sand and river silt together.

Q. It is made up of both?

A. Yes, sir.

Q. And the point of deposition of the silt carried by the waters of the river—would this be the natural point for the deposition of any other solid matter carried by the waters of the river?

A. Not so specifically confined as to locality. The place of deposit of river silt would be spread out gradually over the entire floor of the harbor, and the upper portion of the lower Bay, whereas the shoreward complement of the saw tooth action of the water influence is distinct in line with the two shores lines which are projected. The Coney Island shore line projecting to the west and the Sandy Hook shore line projecting to the north and the bar occupies those two lines with a running influence between the two.

Q. Is it not a fact that the bar is formed by the deposition, at least in part of the silt carried by the river waters at the point where the least resistance to its sedimentation exists?

A. Undoubtedly, as I have said.

Q. And is not that the point at which any other suspended matter, sewage or organic or inorganic would also probaly be deposited?

A. The locus of the bar is not the only place where the disappearance of the velocity causes the river sediment to be thrown down. That is an indefinite area extending up into the harbor and down into the Lower Bay, whereas the bar is pretty definitely located.

Q. Would not the same conditions which result in the sedimentation of the silt and inorganic matter carried by the river waters make it the same point at which the organic matter would also be deposited on the bottom?

A. Yes, but the organic matter would not be so narrowly confined in their place of deposit. Being the lighter, they are the last to be deposited, and therefore it would spread out the width of influence, the zone of deposition.

1350 Q. Have you made any experiments to find how widely this ooze is distributed at the bar or thereabouts?

A. Not at the bar. We made boring observations at shallower depths than were found there.

Q. Why do you say then in view of the existence of the bar and the sedimentation that goes on there of both organic and inorganic matter, that the ooze is accounted for by a motion along the bottom of the bay, and not as the result of deposition from the waters of the river carried down to that point?

A. If the ooze had been entirely due to the deposition, I should expect to have found it covering the upper—covering the outer slope of the bar as well as the inner slope, while as a matter of fact that was not observed to be the case. The top of the bar is fairly clean.

Q. Would not the effect of the beating of the water on the outer face of the crest of the bar be to clean it from the ooze?

A. It would, still, that would settle again. The waters would not carry it very far. It would simply swing back and forth.

Q. It would tend to remove it from the face and the crest of the bar, would it not?

A. It would tend to keep it perhaps from coming over the top of the bar, if it were otherwise able to climb over the top.

Q. You were asked this morning whether the presence of bacteria or other organic pollution, pollution of organic substance on the bottom of the harbor, furnished foci for the pollution, contamination of the water, do you remember that?

A. Yes, sir.

Q. What do you understand to be a focus?

A. A place toward which or from which certain lines radiate.

Q. That is your understanding of focus, is it?

A. Yes.

Q. Is a focus used to concentrate light, or intended to dispel
1351 the diffusion of light?

A. Both. If the focus is the source of light then it will radiate, and dispel light from that point. If the light is brought to a common point by other means that will be a point of convergence of the ray of light.

Q. And you think the pollution of the muds at the bottom of the New York Harbor constitute focal points, do you, for the diffusion of the pollution of the water?

A. Yes, given a polluted point on the bottom of the harbor, and given organic matter there forming pabulum for the development of bacteria, either harmful or harmless, and the influence of those bacteria will extend from that point radiating outward.

Q. Where do you get the definition of focus as you have given it?

A. I cannot remember where I did first learn it.

Q. Then a focus is a point of diffusion and not of consentration?

A. It is a point where various lines meet, whether they meet on the way in or on the way out is immaterial.

Q. Is immaterial?

A. Yes.

Q. What processes of chemical examination of the samples of water did your commission particularly devise and direct the agents of the commission to use. I think you testified yesterday that you gave your consideration, your commission gave its consideration to devising and prescribing method of examination of water samples?

A. Yes.

Q. Well, now, what did you do in that line, your commission?

A. We selected and determined what determinations it was most desirable to make on the samples of water in order to yield us the information desired.

Q. But the methods, what methods did you prescribe and direct, if any?

A. The methods were of course different and entirely distinct for each determination. That is to say we determined that we would ascertain the chlorine present in the water. We also de-
1352 termined that we would ascertain the loss on ignition.

Q. On water?

A. Yes, and speaking of the mud also. And each of the deter-

minations which were decided to be made we considered with our consulting analyst, the best and most appropriate methods for each type of determination to be made.

Q. Was not there and is not there now a standard method of determining the amount of chlorine in water?

A. Yes, various methods.

Q. Was that used?

A. Yes.

Q. What did you have to do with the adoption of a standard method?

A. We considered two or three methods which are available and decided on the one finally adopted after a conference and careful consideration of the matter by and with our consulting analyst.

Q. Are there two or three of equal authority?

A. I do not know that you would say they were of equal authority. Each one has its merits in certain cases.

Q. For the determination of chlorine?

A. Yes.

Q. Is there a recognized standard of bacteriological determinations?

A. Yes, various methods or various modifications of the same method.

Q. Did you hear your analyst say here that he had used the standard method in his determinations?

A. He used a method of determination, which was at that time thought best, but which was not then standard. That is to say it had not then come to be adopted by any of the learned societies as being standard. It has since been adopted by the American Public Health Association.

Q. That is the invention of Dr. Jackson?

A. Yes, sir.

Q. And it was your body that determined that that method should be used?

A. Yes, sir.

Q. And he had nothing to do with it?

A. In consultation with Dr. Jackson he had a great deal
1353 to do with it. It was his presentation of the case and his argument in favor of it which led us to conclude that it was the best method for our use and was superior to the then current methods.

Q. What is the novelty of the method of determinations of loss on ignition in the mud samples?

A. I do not think any novelty was claimed for that.

Q. I am asking you.

A. I do not know if it is any novelty.

Q. They used a standard method, did they not?

A. Yes, it was in use long before our commission was established.

Q. Now, as to the unit of measurement which you adopted, is that recognized by any body that you know of besides yourselves?

A. What unit of measurements have you reference to?

Q. That appears on your charts, or your tables?

A. You mean for the loss?
Q. The loss by ignition?
A. The loss on ignition?
Q. Yes.
A. That represents the loss expressed in parts per million gallons of water.
Q. Have you got that on any of your water samples, the loss by ignition?
A. I have it for the mud samples.
Q. I am asking now about the water. You say that represents the loss per million gallons?
A. If I said parts per million gallons, I meant the loss in the number of parts per million of water. If I said million gallons I misspoke.
Q. Is there any standard of that sort which is recognized by scientists?
A. Most of the chemical methods are used in relation to weights. Some of them express the number of parts per hundred thousand, others express the parts per million. It simply represents the removal of a decimal point one place, and inasmuch as both of those bases are used it becomes necessary to indicate which is employed,
whether you mean that if there are three parts it means three
1354 parts per million, or three parts per hundred thousand. There is no absolute and unvarying custom that is followed on those points. Both of those units are employed and from the fact that both are employed, it becomes necessary to indicate which one is used.
Q. I understand that your commission determined what features of the examination of the water samples should be dwelt upon?
A. Yes.
Q. And you fixed upon the determination of the chlorine that was one thing that you determined on?
A. Yes.
Q. And that was for the purpose of determining the salinity of the water only, was it not?
A. Yes.
Q. What other features did you determine upon as proper subjects of inquiry?
A. Turbidity.
Q. Turbidity?
A. Yes.
Q. And what else?
A. Color.
Q. What else?
A. Bacterial contents.
Q. What else?
A. The presence of B. Coli.
Q. What else?
A. I shall have to refer to the exhibit. (Witness examines exhibit.) A. (Continuing.) We determined the depth at which the sample was taken below the surface of the water, also the stage

of the tide, and the direction of the wind and the temperature of the water.

Q. That was to identify the sample, was it not?

A. Well in part so, not wholly.

Q. Now, what did you seek to determine by the examinations by your analysts and chemists?

A. Those that were obtained by the analysts or chemists?

Q. What was your purpose in having these determinations made; what were you trying to show?

A. Trying to discover the real character of the water as far as it was possible to do so.

Q. With reference to what?

A. With reference to its present state at the time we examined it.

1355 Q. As to what?

A. As to its present contents of pollution, the present measure of pollution and as to its composition, and as to whether it was fresh water or salt water, or in what proportion it was a mixture of the two.

Q. Were you not seeking to determine whether its digestive capacity was anywhere near the point of exhaustion?

A. That was one of the things that we tried to obtain information on.

Q. Was not that the main thing that you were seeking to find?

A. It was, but that was out of our reach immediately and we had to obtain a good many preliminary facts before reaching that final question.

Q. And you are now dealing in this examination with 951 samples of water, are you not?

A. Some such number, yes, 931.

Q. What is the important element to determine the presence or absence of in water, when you wish to determine its capacity to digest sewage?

A. A number of things need to be determined.

Q. I ask you what is the most important?

A. I should not like to say, to draw a comparison between them.

Q. Do you not know what the most important is?

A. I think perhaps the bacteria, if you can have but one, it is the most important.

Q. You do not place free oxygen in that category at all?

A. Oh, yes.

Q. Why did not you determine it?

A. Because we thought for the time being our activities would be better directed to obtaining data on other things.

Q. You took 931 samples and analyzed for these other things and you did not go into that important question of the presence or absence of free oxygen?

1356 A. Did not go into that directly, no sir.

Q. Do you give any great value to the work of your commission for determining the main question of the capacity of this

water to absorb and digest sewage in the absence of that determination?

A. Yes, I think it has importance.

Q. I ask you whether you gave great weight to it?

A. Perhaps I am a prejudiced observer.

Q. When was your commission appointed?

A. In June of 1906.

Q. Do you know whether there was any sewage project then in contemplation that had the authority of law for the Passaic Valley at that time?

A. Well, at this time I would not attempt to specify the date, as to just the degree of legislative authority which existed at that instant.

Q. What was your commission in your understanding of it, directed to do?

A. Our commission was directed to investigate the present condition of pollution of New York Harbor and to suggest, to recommend what action should be taken. I should have mentioned a second matter to co-operate with similar bodies from the State of Jersey with a view to ascertaining whether by co-operation the large problem of the disposal of the sewage of the entire Metropolitan district might be solved, in a way to effective, and without conflict between the two commonwealths.

Q. To discover some way in other words, by which the City of New York could continue the pollution of the Bay without interference by anyone else, was not that it?

A. I do not think so at all.

Q. What body was there in the State of New Jersey that had any similar jurisdiction to your Metropolitan Sewerage Commission, if you know?

A. I am not aware that any had just parallel jurisdiction.

1357 There were two or three bodies which we thought perhaps might think they had jurisdiction to co-operate with us. The State Board of Health for one, and the State Sewerage Commission, and the Passaic Valley Sewerage Commission.

Q. Why did you think that the Passaic Valley Sewerage Commissioners had any such jurisdiction; what reason had you to think it?

A. We of course did not assume they had jurisdiction outside of their own territory, but since their territory was rather extensive, we rather supposed they might feel they had authorization to deliberate on questions which affected their jurisdiction, their territory.

Q. How does it affect their territory; do you know what their territory is?

A. Approximately, yes.

Q. And do you know what their duty is?

A. Approximately, yes.

Q. To prevent the pollution of the Passaic River?

A. Yes.

Q. What has that got to do with your problem?

A. It has a very great deal to do with our problem, speaking of the problem in general, the solution of the problem of the disposal

of the sewage in the entire Metropolitan District, regardless of state lines, that is a problem in itself, which stands by itself and ought to be treated by itself regardless of state boundaries.

Q. And you recognize the Passaic Valley as part of the Metropolitan District of which you speak?

A. I do.

Q. Now, that was in 1906, when you were appointed?

A. Yes, sir.

Q. When that duty was imposed upon your commission?

A. Yes.

Q. And you made your examination of various features of the problem, and have reported them, have you not?

A. No, sir, we did not report them. We left the work incomplete when the commission was reorganized, but we left our re-
1358 sults in form to be used, and they have been used and are here offered and presented.

Q. You made no recommendation or report of your activities?

A. Made no final report or recommendations.

Q. You found the waters of the harbor of New York, particularly along the shore lines of the Borough of Manhattan and the Borough of the Bronx and the Borough of Brooklyn—yes and the Borough of Queens—being seriously polluted, did you not?

A. In places, yes, sir.

Q. Did you recommend any action to be taken on the part of the Greater City of New York to cause this pollution to cease?

A. I did not, no, sir.

Q. Is this a paid commission, Professor?

A. No, sir.

Q. No salary attached to it?

A. No salary attached to it.

Q. Why did not you make any report or recommendations?

A. Because our commission was reorganized and the personnel changed before we reached the point where we were prepared to make any recommendations, either as against New Jersey or against New York, or any points as a finished conclusion.

Q. Well, now, did you understand that you were commissioned to make a report against the State of New Jersey?

A. If the commission had completed its labors we would have drawn certain conclusions and reported them whether they were adverse to New Jersey or favorable, and whether they were adverse to New York or favorable.

Q. What feature of the New Jersey situation did you think you were called upon to report on or consider?

A. Among our duties was that of giving particular attention to the cause of threatened pollution of New York Harbor from the contemplated Passaic Valley Sewer.

1359 Q. When was that matter brought to your attention, that contemplated pollution of New York Harbor by the Passaic Valley Sewerage Commissioners?

A. I cannot say when it was brought to my personal attention first. I knew of it informally and unofficially during the time that

it was being agitated by the several Passaic Valley Commissions beginning back I think, at 1901 or 1902. My attention was drawn to it by a conversation with a member of one of the commissions, I think it was about the year 1901. I had heard of it before that. At the time the matter took somewhat more definite shape my attention was called to it again as an official of the State Board of Health of New York.

Q. When was that?

A. That was early in 1903, perhaps the latter part of 1902.

Q. Are you aware or are you not aware of the fact that that project of 1903 was declared to be unconstitutional and entirely abrogated by 1906?

A. I so understood. They had judicial difficulties and they were gotten around, substitute methods were obtained for meeting the difficulties which occurred. Nevertheless the project was continued in some form.

Q. When you say the project was continued, what do you mean by that?

A. I simply mean the project.

Q. There was talk about it, that is all you mean, don't you?

A. Rather more than talk, action was taken, and commissioners were appointed and there was study by the commissions and reports by the commissions. I am not now narrowing my term "project" to any particular definite set of plans, but the enterprise to improve, to give the much needed sewerage improvement for the Passaic Valley. That was being discussed and being actively attempted and being actively studied by one commission and another, by one plan and another and that is what I speak of as the Passaic Val-

1360 ley project.

Q. And the duty, as you understood it in 1906, of the Passaic Valley Commission was still for the Passaic Valley Sewerage Commission to prevent the pollution of the Passaic River, did you so understand it?

A. I understand that was their prime first duty. I did not assume then and I do not now that that was their whole duty. I assume that it was their duty to accomplish that without doing harm in other ways, by the Act of so doing it.

Q. Well, do you know whether in 1906 and until March 1907, they had any authority in law to do anything except on the line of prevention?

Mr. O'Sullivan: I object. This clearly calls for a judicial dictum from this witness which he has not been qualified to give.

The Commissioner: Note the objection of counsel for the Complainants.

A. I shall have to answer that as I did the former one. I do recall just what the status of the various legislation and judicial decisions was at that particular date. I know that from the beginning of the discussion in 1901 or 1902, or perhaps even earlier than that down to the present time there has been a project to improve the sewerage conditions of the Passaic Valley, and the municipalities in that

region by plans more or less similar and still more or less different as to details. At this moment, I do not now recall just what my understanding was as to that particular date 1906, and up to March, 1907. I know a new Act was passed early in 1907.

Q. When did your Metropolitan Sewerage Commission have its reorganization?

A. Early in the year 1908.

Q. Did their activities extend to the year 1907?

A. Yes, sir.

Q. Up to what date?

A. Up to the end of the year.

1361 Q. Did they examine any plan of the Passaic Valley Sewerage Commissioners during the year 1907?

A. I think so.

Q. What was that plan that you examined, and where did they find it?

A. Whatever examination was made was made by means of conferences with the Passaic Valley Sewerage Commission or with sub-committees of that commission.

Q. Well, now, when did you hold a conference with the Passaic Valley Sewerage Commissioners in 1907?

A. I cannot give you the date. We had, I think, two conferences during the year.

Q. In 1907?

A. I think so, yes, sir. It is possible that may have been in the latter part of 1906.

Q. Where were these conferences held?

A. In the office of the Metropolitan Sewerage Commission of New York.

Q. Who were the commissioners that were present from New Jersey on that occasion?

A. I cannot tell you now. Our minutes would show that. I have not had a chance to examine them.

Q. Did you have any conferences during 1907 with the New Jersey State Board of Health?

A. We had some communication with them by correspondence Whether that was followed up by a conference I have been unable to say at this time.

Q. Did you have any conference with the New Jersey State Sewerage Commission during 1907?

A. I am unable to say, but I think not.

Redirect examination by Mr. O'Sullivan:

Q. I did not follow the last answer, and he asked you as to whether you held conferences with the New Jersey State Sewerage Commission or was it the Passaic Valley Sewerage Commission, which one of those bodies was it?

A. My impression is that we met with the Passaic Valley Sewerage Commission and possibly also with the New Jersey State

1362 Board of Health, or sub-committee thereof. I do not remember that we met at all with the State Sewerage Commission of

New Jersey. It is possible we did. On that whole matter I am depending entirely on my recollection, which is now four or five years old, and without having referred at all to the minutes of our conferences to refresh my mind.

Q. Who was present on behalf of the Metropolitan Sewerage Commission besides yourself?

A. I think on the first occasion all the members substantially were present.

Q. Was Mr. Provost present?

A. Yes, sir, Dr. Lewis, I think; also Dr. Soper, whether Mr. Fuertes was present or not, I cannot say at this time. I think at the subsequent meeting perhaps less than a full number were present.

Q. Did anything result or flow from these conferences?

A. I am sorry to say it did not.

Q. Will you state why?

A. We hoped that might be the case and delayed our work, delayed adopting our final program of work, hoping that we might be able to reach a co-operative scheme of investigations by which we should be able to concentrate our activities, our studies, on certain parts of the harbor and ask New Jersey to concentrate theirs on certain other portions and thus perhaps secure a greater volume of information than we could be able to do separately, but, unfortunately, nothing came of the efforts to co-operate.

Q. In reply to a question put to you by Mr. Riker you said that you included the territory in New Jersey that the Passaic Valley Sewerage Commission has jurisdiction over, in what you described as the Metropolitan Sewerage District did you not?

A. Yes.

Q. Why?

A. Because it all lies within the natural boundaries of the territory which should have its sewerage facilities planned harmoniously, planned in common, even if not by a common single system. It should in my opinion all be studied and all be planned in
1363 keeping with the highest degree of efficiency without regard to state lines. Of course paying proper regard to territorial jurisdiction and provision by which the two different commonwealths should retain adequate jurisdiction over their construction, but as to providing a common means of sewerage, that we hoped might be done just as it is done in the case of Boston and two or three other cities, who have merged their individual territorial jurisdiction so far as sewerage goes into a common metropolitan sewerage district. The problem there, it is true, is a little smaller than it would be here due to the fact that all the municipalities lie within one State, but we did not think that even the added difficulty arising from the fact that there were two states was insurmountable. We hoped a plan might be reached by which in the first place the question should be studied by the two together, working harmoniously together and as the result of such studies we hoped to settle the question as to what would be necessary to accomplish a harmonious construction or a harmonious series of constructions, through all parts of the district. That they would work together harmoniously and ac-

complish the desired sewerage improvement for the entire Metropolitan District, in which I include, in my meaning the parts which naturally lie there, whether they lie within the State of New York or the State of New Jersey, and in which natural district the Passaic Valley Sewerage Improvement, or at least a large part of it, naturally lies.

Q. And the drainage areas of that entire Metropolitan district, which included territory in both streets has a common point of discharge, has it?

A. They have common points which are not far apart. The mouths of the Passaic and Hackensack Rivers on the one hand, uniting at the head of Newark Bay, being not far removed from the mouth of the Hudson and the mouth of the East River, to
1364 speak of that as a river. They all discharge into one common series of bodies of water.

Q. So that you regard the problems as common to both states to be solved?

A. In large measure the problem was a common one. In certain parts it was an individual problem for each estate, but the large questions were in our opinion common questions of common interest.

Q. And could that be solved by joint action?

A. Could thus be solved by joint action, or at least harmonious action in which each state should — to do what it decided to do in full harmony with what the other state was doing.

Q. Have you got with you, Professor Landreth, a copy of any Passaic Valley Sewerage Commission report?

A. I have a copy of the Passaic Valley Sewerage Commission report of the year 1908. I do not know whether I have any of the earlier reports or not. I think not.

Q. Mr. Riker asked if you studied any of the plans as set forth by that commission. Are any of them contained in any of the reports——

Mr. Riker: One moment, my recollection of the question is whether during the year 1906 and 1907 their commission studied any——

Mr. O'Sullivan: That is what I am confining myself to. All this witness' testimony so far has related entirely to the years 1906 and 1907 at this session.

(Question repeated by the stenographer.)

Mr. O'Sullivan: Prior to 1908?

A. Yes, those plans in various forms were contained in several reports which were issued prior to 1908. The report for 1908, however, contains substantially the plans which were under deliberation during the year 1907.

Q. Were you familiar with those plans during the year 1907?

A. Somewhat, yes, sir.

Q. Mr. Riker has directed your attention to the fact that there were no oxygen determinations in the tabulations here of the
1365 water samples. I ask you was the character of the work undertaken by the Metropolitan Sewerage Commission pre-

gressive in its character from the mere physical examinations to the more classical, chemical and bacteriological determinations, and, if so, whether or not many thousands of oxygen determinations have been made since the time of the period that you have testified to.

Mr. Riker: I object to the question on the ground that it is not redirect examination and that this witness' testimony has been explicitly confined to the years 1906 and 1907.

The Commissioner: Note the objection, of counsel for defendants.

A. The work done during the years 1906 and 1907 was intended to be progressive. The first division of the work undertaken were those that we thought at that time the most essential, not that we thought them adequate or final and complete, and it was the intention then to follow that work by other determinations the contribution of which, however, was largely dependent on what should be found by the first studies, and the determinations which were made were those which we thought would give us the greatest volume of suggestive and directive information as to what more refined—that other determinations should *be* later be made. Since that time I understand a great many other determinations have been made.

Q. So that some of the work undertaken here has been carried on along the same lines and *as* suggested new lines of work which have been taken up?

A. Yes, sir, some of this work has been completed by the present commission, some has been discontinued as being no longer necessary. Other lines of work have been undertaken which were not undertaken at the time of the re-organization of the commission.

1366 Q. And more lines of work were made necessary and were directed by the prior work which you have tabulated there?

A. More lines of work and they have been more intelligently and more effectively done on account of the foundation which we laid for them.

Recross-examination by Mr. Riker:

Q. Do I understand by your last testimony, Professor Landreth, that you did not appreciate the importance of oxygen determinations in 1906 and 1907?

A. I do not think my testimony could be so interpreted.

Q. You did not wish to be so understood?

A. No.

Q. You have testified, have you not, that one of the purposes of the examinations of the marine vegetable life was directed for the determination of whether it was giving off a proper amount of oxygen into the water; do you remember testifying to that yesterday?

A. Not quite that, no, sir. My testimony was that in our visual inspections of the sewers we paid attention to the condition of the marine life, as it was found attached to the shores and rock and piles and docks as bearing on the question of furnishing contribution to the supply of oxygen in the water.

Q. Then you appreciated at that time the supply of oxygen in the water, that that was a very important feature of the problem?
A. We appreciated it was an important problem yes.
Q. Then when you have 231 samples of water taken and identified and removed to your laboratory, why did not you have the oxygen determinations made on those samples?
A. Because at that time we considered that our efforts could be better directed, during the early stage of our activity, to determinations of things that we did undertake, rather than at that time to begin the oxygen determinations.
Q. Could be better directed to doing things that you did do and not things that you ought to do?
A. The first things to do.

1367 Redirect examination by Mr. O'Sullivan:

Q. You were a member of the New York Bay Pollution Commission between 1903 and 1905?
A. Yes.
Q. And under your direction were oxygen determinations made by the commission?
A. Under the direction of the commission, yes, sir.
Q. And sufficient to follow the directions of the legislature that created the commission to investigate and report as to what should have been done?
A. Yes, as far as the facilities of the commission made it possible to do.
Q. And on undertaking the broader work of this Metropolitan Sewerage Commission you considered it essential to establish lines of work that are tabulated there in the preliminary investigation?
A. Yes.

Recross-examination by Mr. Riker:

Q. Did you assume to examine the reports of oxygen determinations in the year 1906 in detail at all?
A. What reports have you reference to?
Q. I am referring now to the last questions that counsel for the State of New York has asked with reference to certain determinations of oxygen which were made before the Metropolitan Sewerage Commission came into existence. Do you remember testifying to that?

Mr. O'Sullivan: I specified the years 1903 to 1905.

Mr. Riker: Well, 1903 to 1905, do you happen to remember in detail any of those determinations?
The Witness: Yes, in detail, I remember we made quite a good many determinations. If you mean by detail the precise numerical values, I do not.
Q. Do you happen to remember the numbers that were made on the sample taken at Robbins Reef?

A. I cannot remember the numerical values of the oxygen contents at that point.

Q. You do not remember that it showed a normal amount
1368 a little above the normal amount of oxygen contents?

A. Several samples were obtained at that point which have you reference to?

Q. I am asking whether any of them in your recollection, showe at least a normal oxygen content?

A. My impression is that some of them showed very near saturation, whether they were fully saturated or not, I cannot say.

Mr. O'Sullivan: Do you recall my examination of Dr. Jackson who made the determination that was taken at flood tide, that sample that you have just been asked about?

The Witness: I knew it was at flood tide. I do not remember just what you asked Dr. Jackson about, however.

At 4 P. M. adjourned to January 3rd, 1912, at 10:30 A. M., the meeting to be held in the Finance Committee Room, City Hall, January 3rd, 1912 at 10:30 A. M.

1369 Supreme Court of the United States, October Term, 1911.

THE PEOPLE OF THE STATE OF NEW YORK, Complainants,
against
STATE OF NEW JERSEY and PASSAIC VALLEY SEWERAGE COMMISSIONERS, Defendants.

CITY HALL, NEW YORK CITY,
January 3rd, 1912—10:30 a. m.

Before James D. Maher, Esq., Commissioner.

Appearances:

Dr. William J. O'Sullivan, Special Counsel for the People of the State of New York.

Adrian Riker, Esq., of Counsel for the Passaic Valley Sewerage Commission.

Joseph Coult, Esq., of Counsel for the Passaic Valley Sewerage Commission.

Robert H. McCarter, Esq., Special Counsel for the State of New Jersey.

Met pursuant to adjournment.

PAYN B. PARSONS a witness called on behalf of Complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Dr. Parsons, when you were on the stand before I think you stated the colleges that you graduated from, did you not?

A. Yes.

Q. What specialty in medicine have you followed, Doctor, since your graduation?

A. Why I made a specialty of bacteriology. I took a special course in that after graduating from Medical School and made a specialty of that work, bacteriology.

1370 Q. And you were connected in that capacity with the New York Bay Pollution Commission?

A. Yes. My work with the New York Bay Pollution Commission was mainly as a Sanitary Inspector, but since then with the various Metropolitan Sewerage Commissions I have been the bacteriologist, since they started.

Q. And you did bacteriological work in the laboratory for the Metropolitan Sewerage Commission in 1907?

A. Yes.

Q. And you so testified?

A. I was their bacteriologist, yes, sir.

Q. Are you connected in that capacity with the present Metropolitan Sewerage Commission?

A. Yes, I am.

Q. In 1909, Doctor, did you make any oxygen determinations for the Metropolitan Sewerage Commission?

A. I did.

Q. Under whose directions did you do that work?

A. That work was done under the—was done for the Metropolitan Sewerage Commission under the direction of the commission, and under the direct direction, you might say of Dr. G. A. Soper, President of the Metropolitan Sewerage Commission.

Q. How many of these determinations did you make?

A. In 1909 I made 872 oxygen determinations.

Q. What method did you use in these oxygen determinations?

A. I used a method that has been called a modification of the Albert Levy Method. It is the method that Dr. Soper brought over from Europe, and is, with a few modifications, practically the method used by the Royal Commission—I was trying to think of the exact name of the British Commission—the Royal Commission on Sewerage disposal I think the name was, in Great Britain, in their work in studies of sewerage conditions in Great Britain.

Q. Who prepared the standard solutions which you worked on?

A. They were prepared by Dr. Metzger of Columbia University.

Q. Is he connected with that institution in any teaching capacity?

A. Yes, he is a professor. I believe his exact title is As-

1371 sistant Professor of Analytical Chemistry.

Q. Did he conduct check experiments?

A. He kept the solutions checked up. Standardized those and went out with me a number of times, watched my technique and to watch the details of the test regarding the collection and the making of the tests.

Q. Now several hundred determinations that you made, have you got the results of those tests with you now?

A. Yes, I have them here in the form of blue prints.

Q. Let me look at them, Doctor?

A. For submitting in evidence.
Q. What do you say?
A. I had them put in that form in the form of blue prints to submit in evidence.
Q. Have you got another copy of it?
A. I have more, but they are not here, Doctor. I can get you plenty of them, but I have had to work overtime to clip those this morning. I have six series. That is the only series that is bound and ready for duty.
Q. Is this the tabulation of the work that you did on the several hundred samples?
A. Yes, it is.

Mr. O'Sullivan: I shall offer that in evidence.

Cross-examination by Mr. Riker:

Q. What part of the offer represents your personal work?
A. The whole thing is my personal work with the exception of the work under the column saying "Exact", where the location is given and the latitude and longitude. That represents the work partly of myself and partly of the draughtsmen connected with our commission.
Q. Do you mean by that that you actually took the samples yourself?
A. Yes, I did.
Q. Where are your original field notes?
A. They are right here (Witness produces field notes.)
Q. They are right before you and do they contain the memoranda made at the time?
A. Yes.

1372 Mr. O'Sullivan: Counsel for complainants now offers to counsel for defendants the field notes made by this witness at the time of the taking of the samples.

Q. Where is the original tracing from which these blue prints were made?
A. Here.
Q. Did you make them?
A. That is typewritten. My original reports were not in such condition that they could well be blue printed, so my reports were typewritten and then blue printed from that. They are exact copies, the typewritten reports have been compared by me and found to be exact copies of my original reports, which, with the exception of the latitude and longitude, as I explained, and these typewritten sheets were blue printed, and you have these before you.

Mr. Riker: I object to the offer on the ground that they appear to be copies of originals and that they could only be used in evidence as memoranda to refresh his memory, and they are therefore not properly exhibits in the cause.

The Commissioner: Note the objection of counsel for the defendants.

Mr. O'Sullivan: Counsel for complainants offers to counsel for defendants the original typewritten tabulations, from which these blue prints were made, and which are part of public records, which he is not permitted to put in evidence, and this offer is made for the purpose of any comparison with the blue print offered.

(Counsel for defendants examine originals and blue prints.)

Mr. O'Sullivan: I offer it in evidence and ask that this be marked Complainants' Exhibit No. 31, being tabulations of dissolved oxygen determinations samples 35 to 872, samples of water taken at the times and under the conditions set forth in the tabulations.

1373 The Commissioner: Received and marked Complainants' Exhibit No. 31.

Marked Complainants' Exhibit No. 31.

Redirect examination by Mr. O'Sullivan:

Q. Doctor, directing your attention to the first column of Complainants' Exhibit No. 31, I ask what the word there under the heading "Sample No." means?

A. That means the number of the sample. 35 was the first sample submitted, as the note explains at the bottom, samples 1 to 34 cover preliminary studies of the method. 35 was the beginning of the work.

Q. And the samples 1 to 34 were tested for what purpose?

A. They were preliminary studies of the method. This method that was used in all of the tests from 35 to 872 inclusive.

Q. And having satisfied yourself by the 34 tests of the methods you then applied the method to all the samples that are tabulated in Complainants' Exhibit No. 31?

A. That method was used. The method I have spoken of was used in all the tests that are in this exhibit.

Q. Now in the second column the hours are given; to what do these hours relate?

A. That refers to the time of collection of the sample.

Q. And under the column heads "approximation" with the upper head of "location of samples" what does that column relate to?

A. That refers to the location of the sample as contained in the field notes. The location that was given by me, or put down by me when I collected the sample.

Q. And that term "approximate" indicates that you made a fair effort to determine with a measurable degree of exactness, the location, is that so?

1374 A. Yes, that indicates that the location was determined as exactly as I could.

Q. Now the next column with the word "exact" over it, what does that relate to?

A. That is—it is an idea I might say of the President of the Commission to show the location on a basic chart. That is to say

supposing a person wanted to take a chart and plot out and find the location on that chart. By using the figures here, the latitude and longitude, they could put that out, if there was any doubt as to the point where the sample was taken.

Q. Now the next column is headed "feet below the surface", to what does that apply?

A. Feet below the surface indicates the depth of the water in which the sample was taken. That is to say the one foot sample was taken 1 foot below the surface of the water, the 20 foot sample was taken 20 feet below the surface.

Q. Now, the next column is headed "tidal currents" to what does that relate?

A. That relates to the direction of the currents at the time the sample was taken. That is to say instead of using the term "tide flood" or "ebb tide" I have used the term "currents" in order to indicate the exact direction of the tide. That is to say during the flood tide, the action of the current might run ebb, that is so say might run out during a certain part of the flood tide. This column indicates, the heading indicates the direction which the current was running at the time, whether out or in. Flood indicating in a majority of the locations, the incoming—without going into detail, and ebb indicating the outgoing, although that does not apply to all locations.

Q. At certain depths, would the water be ebb current on the surface, and flood in the underrun?

A. It has been known to do that, yes.

Q. Now the next column dealing with the temperature of the water, on what scale of thermometer were those temperatures
1375 taken?

A. Centigrade.

Q. And the degrees in that column relate to that centigrade?

A. Yes.

Q. Scale thermometer?

A. Yes.

Q. In the next column the "percent of land water", what does that relate to?

A. That refers to the percentage of fresh water. The term "land water" is used as synonymous with the term "fresh" as somtimes used. Fresh water as distingished from sea water and the percent of land water is obtained from the salinity.

Q. And does that column represent the salinometer test?

A. That column does represent the result of the salinometer test, yes.

Q. Now, the last two columns under the generic head "Oxygen" the first with the cubic centimeters per liter, to what does that column relate?

A. The first column shows the number of cubic centimeters per liter of each test.

Q. Does that column relate to the oxygen contents, the volumetric contents?

A. Yes.

Q. The second column with the heading "per cent of saturation," what does that relate to?

A. The second column, the per cent of saturation shows the percentage of saturation of this sample, taking as a basis a diagram made up by the Royal Commission of Great Britain showing—this diagram shows the saturation figure for various temperatures, and for various degrees of salinity. That is, it shows the saturation figure for distilled water and for sea water and various percentages of land water between the two.

Q. The first page in this series reads "Kill von Kull cross section and course" what does that mean?

A. The cross section means a section taken between two points on opposite sides of the stream, a section across the river
1376 or the stream, and a course indicates a series of samples taken, running lengthwise of the stream between two points.

Q. Does that table on the first page represent both modes of determinations?

A. It does. It represents a cross section at New Brighton, and it represents between the two cross sections a course taken up the Kill.

Q. There is a part here which reads "Low water occurred at Governor's Island at 11:32 A. M." Where did pou get the low water observation from? Did you make it yourself?

A. The low water observations continued in these reports is the actual time of low water as near as it could be obtained. The low water that I used in starting to take my samples was the predicted low water. Then, in making up the reports I found out the actual time of low water from the various places where it is taken, taken by different departments and I put that in the report, so that this represents the actual time of low water or high water when that term is used.

Q. In the second line of this first page, it states that the wind was southeast with a velocity of five miles per hour. How was that fact noted?

A. That fact is approximate. 5 miles an hour is as near as I could judge it.

Q. Directing your attention to the second page of Complainants' Exhibit No. 31, the heading read "Harlem River Course"; How were the determinations made as set forth in that second page,—on that second page?

A. The determinations were made as previously testified to, the same method was used, is that what you mean, Doctor?

Q. I was wishing to know, Doctor, which axis of the water you took along or the transverse?

A. The term "course" is used. It indicates that it is not a cross section.

Q. Directing your attention to the third page of the exhibit, "Harlem River Cross Section at Third Avenue," what does that mean?

1377 A. That means that a section was taken, a series of samples were taken across the Harlem River at the Third Avenue Bridge, the Harlem River.

Q. Directing your attention to the next page which reads "Hudson River cross section at Riverdale," what does that mean?

A. That means that a series of samples were taken across the Hudson River from Riverdale to a point opposite.

Q. And at the various depths set forth in that table?

A. Yes.

Q. Directing your attention to the next page, Doctor, which is headed "Newark Bay Cross section and Passaic River" what does that mean?

A. The Newark Bay cross section indicates that a series of samples were taken across Newark Bay at the Ceneral Railroad of New Jersey Bridge, that being the lowest drawdridge in Newark Bay, and the samples in the Passaic River were taken in the form of a course from near the mouth to the Pennsylvania Railroad Passenger Bridge in Newark.

Q. What was the highest point on the Passaic River that you made any determinations of oxygen as set forth on that page?

A. I never went above the Pennsylvania Railroad Passenger Bridge. It is at the foot of New Jersey Railroad Avenue, I believe.

Q. Were the methods employed in making the cross section of Newark Bay and the Passaic River, were those methods identical in operation with those recorded in the preceding pages?

A. Yes, they were.

Q. I direct your attention to the next page, Doctor, which reads "Newark Bay Cross Section and Passaic River continued." That represents the stages of the work on that cross section?

A. Yes, where one day's work could not be put on the same sheet it was carried over on the next sheet and the word continued used.

Q. The next page, Doctor, reads "the Harlem River cross section at East 118th Street," what does that mean?

1378 A. That means that a series of samples were taken across the Harlem River from the foot of East 118th Street. That is between the foot of East 118th Street and Randall's Island.

Q. And does that follow through the rest of this exhibit No. 31, where the headings read "Cross sections of the various areas of water" and where the term "course" appears?

A. Yes, the same principle applies right through.

Q. How many cross sections were taken altogether in Exhibit No. 31, and how many area determinations?

A. Do you want me to figure that up, Doctor? I can do it.

Q. You may make a general answer?

A. Probably it would take fifteen or twenty minutes. I can do it. I never have done it.

Q. What I wanted to get at was whether you covered the areas of water pretty fully or to a limited extent.

A. The Metropolitan District was pretty well covered.

Q. Did you take in the Gowanus Bay and Canal?

A. Yes, I did.

Q. Wallabout Bay?

A. Yes.

Q. Newtown Creek?

A. Yes.

Q. East River?
A. Yes.
Q. Rockaway Inlet?
A. Yes.
Q. Jamaica Bay?
A. Yes.
Q. Harlem River?
A. Yes.
Q. From the Brooklyn Bridge to Hell Gate?
A. Yes.
Q. Hudson River, Mount St. Vincent to Yonkers?
A. Yes.

Mr. Riker: Does not the exhibit show what he did?

Q. Gravesend Bay?
A. Yes.
Q. The Narrows?
A. Yes.
Q. Sandy Hook and Shrewsbury River?
A. Sandy Hook Bay and Shrewsbury River, yes.
Q. Did you make any determinations in the Lower Bay?
A. Yes.

Q. And determinations in the neighborhood of Ward's
1379 Island to Spuyten Duyvil?
A. Yes.

Q. The Harlem River from Ward's Island to Spuyten Duyvil?
A. Yes.
Q. Did you make any determinations in the Kill von Kull?
A. I did.
Q. Did you make any determinations in the Atlantic Ocean itself?
A. Yes.
Q. For what purpose, Doctor?
A. Merely as controls, the data being to get the saturated water. We went out 12 miles beyond Long Branch.
Q. Will you explain what you mean by the word "control"?
A. Well the control is whenever you are examining polluted water in order to back up your test, you might say, you examine water that is supposedly good.
Q. Did you make more than one series of determinations in the Passaic River, Newark Bay and Kill von Kull?
A. Yes, more than one.
Q. Does that apply to the East River and Hudson River and Long Island Sound?
A. It applies to the Hudson River and the East River, where they were repeated several times, but as to the Long Island Sound, I do not remember how many series I made. I can tell that by looking it up.
Q. Did you make any determinations in the Arthur Kills?
A. Yes, I did.
Q. Raritan Bay?
A. Yes.
Q. Doctor, the questions I asked you relative to the columns on the

first page, and which give the sample number, the hour, the approximate location of samples, the exact location of samples, and the feet below the surface, the tidal currents and the temperature of the water, and the percent of land water and the oxygen determinations, both in cubic centimeters per liter and percentages of saturation—do your explanations of those columns apply to every
1380 page on this exhibit number 31?

A. Yes, they do.

Mr. O'Sullivan: Your witness, and complainants' counsel hands the original tabulations to defendants' counsel for the purpose of cross examination.

Cross-examination by Mr. Riker:

Q. Over how long a period did the taking of the samples which you have been testifying on extend?

A. This includes the samples taken between June 1st and October 5th, 1909.

Q. Who were you accompanied by on the taking of these samples?

A. In the case of the—well in some cases I was accompanied only by the members of the boat, the crew of the boat. In other cases, in a majority of cases by a man connected with the commission who did other kinds of work. That is to say took samples for other determinations which were taken at the same time as these oxygen samples were taken. On a majority of the trips, nearly all the trips there were others along who attended to other portions of the work. Took samples for other tests, while I devoted my attention to the oxygen.

Q. Who were these men you were speaking of?

A. In the case of the bacteria, the bacteria in the water, the samples were taken by a Mr. Morey.

Q. I am just getting at who they were?

A. I was trying to think of Mr. Morey's initials, he is not at present with the commission. Mr. Morey and Dr. Raymond H. Pond, who did the microscopical work and by Mr. Hoyt who also did microscopical work.

Q. The taking of the samples to which you have been testifying however was done by you personally?

A. Yes, I took all the samples for the oxygen.

Q. And made all the original field entries?

A. And made all the field entries, yes.

1381 Q. And they are contained in these three books?

A. Yes, they are contained in these three books.

Q. Where did you take samples 1 to 34?

A. Well, samples 1 to 34 are not admitted in evidence. It is simply explained by a note that they were preliminary studies of the method.

Q. I was not asking you whether they were admitted in evidence. What I want to know is where they were taken, where they were taken?

A. Well, they are not on the exhibit and I cannot tell from memory where they were taken.

Q. Cannot you take your field books, your original memoranda and tell where they were taken?

A. Yes.

Q. Well, will you take them and tell where they were taken?

A. I do not know as it is necessary to say where they were taken.

Mr. Riker: Very well, he need not tell unless he wants to. I have no compulsory power here. I decline to cross examine this witness any further.

The Witness: I leave it to my counsel, if you wish me to answer the question.

Mr. O'Sullivan: Yes, answer the question.

The Witness: Shall I read the list, the itemized list of the samples where they were taken? Sample No. 1 was taken 2000 feet off Constable Hook on a line from Constable Hook to 71st Street, Brooklyn.

Sample No. 2 was taken at the same location 2000 feet off from Constable Hook on this same line.

Samples Nos. 3 and 4 were taken farther east on this same line.

Samples Nos. 5 and 6 were taken farther east.

Samples Nos. 7 and 8 were taken 200 feet from Spar Buoy A.

Samples 9 and 10 were taken from 600 feet off 71st Street
1382 Sewer.

Samples 11 and 12 were taken 200 feet farther out.

Samples 13 and 14 were taken 200 feet east of Spar Buoy A.

Samples 15 and 16 farther east.

Samples 17 and 18 farther east.

Samples 19 and 20 farther east.

Samples 21 and 22 were taken 200 feet north of Spar Buoy 12½.

Samples 23 and 24 were taken at the same location as the previous two, that is at Spar Buoy 12½.

Samples 25 and 26 were taken forther east.

Samples 27 and 28 were taken farther east.

Samples 29 and 30 were taken farther east.

Samples 31 and 32 were taken farther east.

Samples 33 and 34 were taken 800 feet from 71st Street sewer on this same line where all the samples were taken, between Constable Hook and 71st Street, Brooklyn.

By Mr. Riker:

Q. Is not the location of those samples as definitely described in the field notes as any of the others?

A. No, they are not.

Q. Why did you not tabulate and report on these samples?

A. It has been explained it was a case of simply testing the method.

Q. Why did you select any particular place for taking samples for merely testing the method.

A. Well, some place had to be selected, and a cross section in New York Bay was regarded as a good point to select.

Q. And that is the only reason why they are not reported on?
A. Yes, that is the only reason that I know of.
Q. What method did you use in testing these samples?
A. The samples were tested by various methods. The
1383 Winkler method and this method I have spoken of.
Q. Have you refreshed your memory as to what method was used on these samples?
A. No.
Q. I show you the field book and ask you whether that notation is in your handwriting?
A. Yes.
Q. Does that indicate why the samples were not reported on?
A. Well, it is a case where the—(Witness examines field book.) (Answer continuing:) I say in this note that they were experimental tests and were thrown out. Now, in this note I say that they were preliminary studies of the method.
Q. What else do you say in that note?
A. I do not think it is necessary to say what else.

Mr. Riker: Very well, do not say it. I do not want this witness at all, Doctor, I decline to cross examine him.

The Witness: I do not see, Counsellor, why things that are not put in evidence should be made the basis of a cross examination.
Mr. O'Sullivan: Do not argue.

Redirect examination by Mr. O'Sullivan:

Q. Doctor, I wish you would answer fully that question that counsel puts to you.

Mr. Riker: I object to the witness being asked that question as he declined to answer counsel on cross examination. This is not redirect. You cannot ask on redirect a question which the witness refuses to answer.

The Witness: I did not refuse to answer. I simply asked counsel if he thought it was proper for me to answer a question of that sort.

The Commissioner: Note the objection of counsel for defendants.
Mr. O'Sullivan: The witness is ready to make full answer.
1384 Mr. Riker: I must decline to further cross examine this witness because of the bias he has shown on the examination.
Mr. O'Sullivan: Counsel for Complainants thinks that that comment by defendants' counsel is unfounded. This witness has testified that he did not think it was proper to examine him on matters that were not in evidence and not properly in this record. He now offers to fully answer any questions on matters that are neither in evidence nor before this commissioner. Complainants' Counsel renews his offer to defendants' Counsel to continue the cross examination of this witness, this witness being willing to answer any question, no matter how irrelevant.
Mr. McCarter: Let me ask a question or two.

Cross-examination by Mr. McCarter:

Q. I understood you to say on your direct examination that in ascertaining the quantity of the oxygen you adopted some system that was well recognized, and I think had been adopted by the Royal Commission, is that right?

A. I do not think those are the words I used.

Q. Was that the idea; I cannot quote your gilded language perhaps?

A. I said it was a method that had been used by the Royal Commission of Great Britain, and was brought to this country by Dr. Soper.

Q. When did he bring it to this country?

A. I cannot state exactly that. I cannot really state.

Q. About when?

A. Well, I should judge it was about the beginning of 1909, but I am not certain.

Q. Is that what you mean by the Winkler method?

A. No, I do not.

Q. Then if it was brought to this country, if it had been
1385 adopted by the commission in the early part of 1909, why did not you use it in your first 34 samples?

A. I said——

Q. No, answer my question.

A. Well, I have already answered, I think. I said samples 1 to 34 covered preliminary tests.

Q. I ask you if that had been adopted by the Royal Commission and imported into this country by Dr. Soper in the first part of 1909, if these samples were not taken until June 1909, why was it that you did not use it on the first 34 samples?

A. I suppose Dr. Soper wished to have it tried out in this country before using it.

Q. You did not use it on the first thirty-four samples, did you?

A. I have said that the first 34 samples covered preliminary tests.

Q. Did you use this method on the first 34 samples?

A. My memory does not go back. We used the Winkler test on the majority of them, and I have used this test on some of them. I think my records cover the Winkler test mainly.

Q. It is stated in your note book that samples 1 to 34 were experimental tests, using the Winkler method?

A. Yes.

Q. Now I ask you if you used the Winkler method on the first 34, why did not you use the other which you adopted and brought over from abroad on all of them?

A. Well, I used the Winkler method, tried it out, and I do not claim that this book represents all the experimental work, understand.

Q. I am not speaking about all the experimental work; I am asking about the first 34 samples, and I ask why you used the Winkler method on the first 34 samples rather than this other Royal Commission method in ascertaining the quantity of oxygen?

A. I think I answered that.
Q. Why?
A. It was experimental work.
Q. You were engaged in taking these samples?
A. Yes.
Q. Under a retainer from the Metropolitan Commission?
A. Yes.
1386 Q. Using the same method?
A. As what?
Q. As when you went for the other samples?
A. I could not say positively; I imagine so.
Q. You are employed for this very purpose?
A. Yes.
Q. Now I ask you why you did not use the other method, The Royal Commission Method on the first 34 samples?
A. I have stated the first 34 samples were done by the Winkler method.
Q. Why did not you use the other method on the first 34 samples?
A. I might answer it——
Q. You might answer the truth, that is what you might do.
A. I was going to say, I might state—I do not know that I have stated an untruth—I might state that what I did was done through the orders of the Metropolitan Sewerage Commission. Does that answer your question?
Q. You were ordered to use, not this other method, but the Winkler method on the first 34 is that right?
A. The point is that the record shows samples Nos. 1 to 34 were done by the Winkler method.
Q. Were you ordered to do it by the Metropolitan Commission?
A. Certainly.
Q. Who ordered you?
A. I was ordered to do it.
Q. Dr. Soper?
A. I will not state that I was ordered to do so.
Q. Then you were mistaken a moment ago?
A. I will say that I am not sure. I am not certain as to whether I was ordered to do those particular tests by that method or not.
Q. Then again I ask you why it was that after having been employed to do this work, and starting out to take all this large number of samples, then using the Winkler method for the first 34, which were thrown out and then using this other Royal Commission method for the balance?
A. You asked me why I used that for the first 34, is that the idea?
(Question repeated by the stenographer.)
A. I will state the results of the tests show that the Winkler
1387 method is often imperfect according to my judgment.
Q. Had you made the tests by the Winkler method before you got the balance of your samples?
A. Had I made the tests by the Winkler method before I got the balance of the samples, will you explain what you mean by "balance"?

Q. Had you collected the balance of the samples from 35 to 872 before you tested numbers 1 to 34 by the Winkler method?

A. Why, they were tested immediately as soon as they were collected, of course. I explained that.

Q. Won't you answer my question, Doctor?

A. I do not know that I understand exactly the idea.

Q. I am asking for information?

A. The samples were taken consecutively from 1 up.

Q. Up to what?

A. On consecutive days, from 1 up to the end, and the samples were examined as collected.

Q. Were the examinations made on the boat?

A. Yes.

Q. So that the examinations either by the Winkler method or the Royal Commission method were made on the boat?

A. Yes.

Q. As you collected them?

A. Yes.

Q. Was Dr. Soper there when you examined sample No. 34?

A. No.

Q. Then he did not direct you to change your method, did he?

A. I cannot remember whether he did or not.

Q. You examined Sample No. 35 right on the boat?

A. Yes.

Q. That was taken the same day, was it not, as 34?

A. No, I think not.

(Counsel examines records.)

Q. There seems to be six days between. What is the difference between the Winkler and what you call the Royal Commission method?

A. The difference is very great. Do you wish the details of the tests?

1388 Q. I asked you for the difference between the two methods. Tell us so that we can understand it?

A. In the Winkler method a solution manganous sulphate is used and a solution of potassium iodide, and sodium hydrate. The sulphuric acid is then added and the titration is done by the hypo solution, sodium theo sulphate, starch solution being used toward the end of the titration. In the case of the other method which was used in all samples after 34, the solutions were different. The method was to add to the water in separatory funnels 6 cubic centimeters of ferrous sulphate, 4 cubic centimeters of sodium carbonate, shaking, allowing to stand, adding 10 cubic centimeters of sulphuric acid, 50 per cent, and another solution, titrating with potassium permanganate.

Q. Did you discuss with any members of the commission between the time when you finished your thirty-fourth sample and the time of commencing to gather your other samples, commenced on No. 35?

A. The results were submitted to the commission.

Q. You conferred with members of the commission?
A. Yes.
Q. And you determined to change your method did you not?
A. Yes, that is to say the method was changed.
Q. At whose suggestion, yours or the commission's?
A. The orders for the remainder of the work were given by the commission, The Metropolitan Sewerage Commission.
Q. Who told you to adopt this other method of examination thereafter?
A. From 35 on the orders were given by the President of the Metropolitan Sewerage Commission.
Q. Beg pardon?
A. I say as to the tests from 35 on to the end, the method was suggested by the President of the Metropolitan Sewerage Commission, as to samples 1 to 34 inclusive ——
Q. I have not asked you anything about those?

1389 Mr. O'Sullivan: I submit he should be permitted to answer.

The Witness: As to 1 to 34, to the best of my knowledge, the method to be used was left to me, and was not suggested by the President of the Metropolitan Sewerage Commission.
Q. Now, you had made examinations before of water?
A. Yes.
Q. And always used the Winkler method?
A. Yes.
Q. That was a well recognized and standard method?
A. It was the standard method.

Redirect examination by Mr. O'Sullivan:

Q. You made the determinations on samples numbers 1 to 34?
A. Yes.
Q. And from your check experiments and the instructions which you received from the commission, did you determine in favor of the Albert Levy method?
A. As I remember, I think when I was told to do the tests I started in and did from 1 to 34 inclusive on my own hook, without distinct orders as to the method to be used and on submitting my report I was told to adopt the other method, which I have described as being used for all samples from 35 on to the end. I was instructed to use that method by Dr. Soper, President of the Metropolitan Sewerage Commission.
Q. But from your preliminary examination of these samples and the comparison of the two methods, all these determinations in the tabulation that has been put in evidence as Complainants' Exhibit No. 31 were done by the Albert Levy method, that which was prescribed by the Royal Commission of Great Britain?
A. Yes, all samples over 35, from 35 to 872 inclusive.

1390 Q. And do I understand you, Doctor, that samples from 1 to 34 were taken simply for preliminary work, to test methods?

Mr. McCarter: I object to it as leading.
The Commissioner: Note the objection.

A. Samples 1 to 34, as has been brought out on the cross examination, were done by the Winkler method.
Q. And for the purpose of preliminary studies of that method?

Mr. McCarter: Let him testify, Doctor, do not do it yourself.

The Witness: They were not done as preliminary studies of the Winkler method, because that was an old method, but they were done to try out the method with sea water or bay water.
Q. And the results of these preliminary studies were such as to determine the superior merits of the Albert Levy method?
A. The idea was to try out and see how this method would work with harbor water and to see whether it was satisfactory and to compare it with this method that was subsequently used.
Q. And that subsequent method was the Albert Levy method, the one prescribed by the Royal British Commission?
A. Yes.

Mr. O'Sullivan: That is all.

Recross-examination by Mr. McCarter:

Q. How do you know it is prescribed by the Royal British Comsion?
A. In their report they speak of it being used. They mention the method as being used in all their tests. It is contained in the fifth report of the Royal Commission, Appendix 6.
Q. Did you not say, Doctor, that Doctor Soper had made some modifications of that?
A. We used a slight modification of that, yes.
Q. And what was that modification?
A. The modification consisted principally of using sodium carbonate, instead of ammonia. Sodium carbonate—in the test of an alkali is necessary and sodium carbonate being the heavier
1391 alkali sinks to the bottom and there is less chance of error than in using ammonia, as used by the British Commission.

KENNETH ALLEN a witness called on behalf of Complainants being first duly sworn, testified as follows:

Direct examination by Mr. O'Sullivan:

Q. Mr. Allen, what is your business or profession?
A. Civil Engineer.
Q. What experience have you had in line with your profession?
A. In 1874 I went to Troy Polytechnic School. After being there two years, I took a year off in connection with work at Boston, work on the construction of some dams. Then I went back to Troy and graduated in 1879. My first work was a year spent as draftsman on the Boston Water Works under Mr. A. *Fteley*. Graduated as Civil Engineer at Rensselaer Polytechnic Institute in '79 and after

spending a few weeks in the office of Mr. Hiram F. Mills, of Lawrence, Mass., Hydraulic Engineer and Chairman of the State Board of Health, went west on railroad work. From 1883 to 1886, Assistant Engineer, Philadelphia Water Supply under Mr. Rudolph Hering. From 1886 to 1890 in private practice with Wm. H. Breithaupt, M. Am. Soc. C. E. (Breithaupt & Allen) in Kansas City and as Superintendent of Construction in charge of construction of sewers, bridges and paving under the City Engineer. Also constructed system of sewage for the War Department at Fort Supply, I. T.

The next three years were spent in charge of special topographical and hydraulic work for the H. C. Frick Coke Co. and the following two years on sewer design and construction under Mr. S. L. Cooper, Commissioner of Public Works, Yonkers, N. Y.

1392 The years 1895 to 1898 were spent in direct charge of studies and preliminary plans for sewerage and sewage disposal at Baltimore, Md., under a Sewerage Commission of which Mr. Mendes Cohen, Past President Am. Soc. C. E. was Chairman.

In 1899 entered into partnership with Nicholas S. Hill, Jr., and A. M. Quick, Members Am. Soc. C. E. (Hill, Quick & Allen) as Consulting Engineers, Baltimore (and later New York), making a specialty of sanitary and hydraulic work.

On dissolution of the firm in 1902, served for 3½ years as Engineer and Superintendent of Water Department, Atlantic City, N. J. then 2½ years as Division Engineer on the construction of the Baltimore sewerage.

For the past three years have served as Engineer of the Metropolitan Sewerage Commission of New York.

My work with this commission has been—

1. In studies of the tides and currents of the harbor.

2. Experiments on the diffusion of sewage in the harbor water.

3. Experiments to demonstrate the pollution of the public bath houses.

4. Inspection of the sewers of Manhattan and, in general, of the sewerage systems of the metropolitan district.

5. Studies of the necessity of sewer reconstruction in Manhattan and the feasibility of treating the sewage; of the proposed method of flushing Gowanus Canal and of the possible pollution of the basins proposed in connection with the Jamaica Bay improvement.

6. Studies of the capacity of Jamaica Bay to receive and dispose of crude sewage.

7. Preparation of a tentative plan for intercepting the sewage from Jamaica Bay and disposing of it.

8. Miscellaneous studies of the salinity of the harbor waters, populations, volume of sewage, etc.

Q. During your connection with the Metropolitan Sew-
1393 -age Commission what phases of their work have you devoted your skill and attention to?

A. First in the studies of the tides and currents of the harbor. That includes some float experiments and a study of data furnished by the Coast Survey principally. They supplied a good deal of data

for the Commission and their reports were gone into pretty carefully, and that was the first work of importance I took up. After that I made some experiments on the diffusion of sewage in the harbor, not always using sewage, but usually using fresh water, using the water from the hydrant.

Q. Dyed?

A. Dyed, yes.

Q. What did you use?

A. We used a dye called uranine principally. We used a red dye called special scarlet, and that is the only name that I could give for it. I do not know what it is. It is a very pronounced dye. We also experimented with other chemicals before choosing the dye to use definitely and we narrowed it down to those two. We made some experiments on the pollution of the public bath houses by putting this dye in the water above or below the bath house at the sewer outlet and watching it either pass through the bath house or pass around it. Sometimes it did not go through, sometimes it did. Then we have made inspections of sewers of Manhattan, the interior of most of the large sewers to see what the condition was, and then there were a number of reports that I made. One of them in connection with the necessity of reconstructing the sewers of Manhattan, and the feasibility of treating the sewage of Manhattan. Also a possible method of flushing the Gowanus Canal, and the possible pollution of the basins proposed in connection with the Ja-
1394 maica Bay improvement. There are long basins, something like the Gowanus Canal, in some ways, that we thought might possible be detrimental on account of the difficulty of flushing them, and then I made some studies of the capacity of Jamaica Bay to receive and dispose of crude sewage, and some studies for the drainage of the area in the vicinity of Jamaica Bay. That is the area naturally draining into the Bay, and of disposing of the sewage. Then I outlined the salinity work that was carried on, the salinometer that was carried on by Mr. Merritt principally, one part by Dr. Parsons, and some observations also by Mr. Hoyt, and I made some studies of the salinity, and the populations and volume of sewage and so on.

Q. You are still connected in the capacity that you have described with the Metropolitan Sewerage Commission?

A. Yes.

Q. Now, did you make some float observations?

A. Yes.

Q. Did you make float observations in the Harlem River in August and September of 1908?

A. I wish to refer to some notes here which I made out.

(Witness refers to notes.)

A. Yes.

Q. Now will you describe what you did what you observed during the float experiments or observations?

A. I will say in general that these observations were made by putting a float, a specially designed float in the water at a certain

point and following it with a boat, and an observer in the boat of course, of course the man to operate the boat——

Q. Will you describe the float?

A. Float, we had two principal types of float. The one that was used most and especially in all the earlier work was made of two cans, cylindrical tin cans, one holding, I think, two gallons, and one one half a gallon. Those are connected by a copper wire, the long one there floating about 3 or 4 feet below the top, the lower one,
1395 the larger one, one end in the water. There was a tension on the wire, the idea being to get principally the direction of the current below the surface not just on the surface, where it is influenced principally by the wind, just below the surface. The top of the float was provided with a little socket for a flag and a stick with a flag. That flag was not up very much because the wind acted on it more than we desired, and it was usually top heavy, the flag was a little heavy, so as we followed them with the boat with the float opposite it was not necessary to use the flag.

Q. How large in dimension would the area be?

A. That was about 5 or 6 inches in diameter, I should say the large one was about 6 and the smaller one about 4½. The lower one went down so that the upper one was nearly submerged. The lower one, the larger one hod an open nozzle by which we could fill it with water and put enough sand or gravel to weight it down to the desired depth. The float was put in and the location noted, and then it was followed with the boat, and the location observed at frequent intervals, usually well, usually until it was time to go home. We followed them as far as we could. If it went beyond the limits that we were studying, we would sometimes take them out. Sometimes they were lost the wire being cut by the propeller of the boat or something of that sort, but we usually followed the float until it was time to take it up, noting the times and locations at short intervals.

With regard to Harlem River, if you will allow me, I will read from this report on the subject dated August 26th, 1908.

Q. One moment, Mr. Allen. How did you determine your locations?

A. The locations were determined in different ways. In the small streams along the river front where we could locate the pier
1396 or street, or where we were within three or four hundred feet perhaps of the end of the pier, we made a note to that effect. Where this was not convenient we used sometimes what is called an azimuth compass. In taking an observation, opposite a certain street which we could recognize up stream or down stream, or perhaps through some bridge or pier or slip, something that could be recognized so as to make an intersection of two lines, the intersection of the line crossing the river at the end of the street and of the line sighted to up or down the river. That made a location. But in general, especially in the open water we used a sextant where we could take observations on prominent points could be located on maps, such as light houses or piers or steeples, possibly.

Q. Now, having determined the location and noted the time, what did you do with the float?

A. When we got through you mean?

Q. No, when you were just starting the operation?

A. We did not touch it in making the observations, we went up within a few feet of it, perhaps 6 or 8 or 10 feet.

Q. And then you followed them along?

A. Followed it, yes.

Q. Now describe in the case of the Harlem River what you did on those float observations made there in August and September, 1908?

A. The first is merely a description of the rivers, giving the distances between certain points from——

Q. By the way, did you report the result of your observations to the Metropolitan Sewerage Commission?

A. Yes.

Q. And is it that now that you are describing?

A. Yes.

Q. You yourself conducted these float observations that you are speaking of?

A. I was not always on the boat. I conducted them but I was usually not on the boat when the observations were taken. The following statement comprises a summary of the principal facts regarding the float records as observed in the Harlem River.

1397 Q. When?

A. Prior to this date, October 26th, 1908, during August and September. I beg to report as follows: Results of float observations made in the Harlem River in August and September. I took the records of these floats and tabulated the results in a statement here. Referring to that statement:

1st. The flood current in the Harlem begins to run about an hour and a half after predicted low water at Governors Island. We referred all these times to times of high or low water at Governors Island. The predicted time is given on the tide tables issued by the government. That is the reference point used by the Government, and was very convenient for our use. So that all of the times noted by us can be referred to the time of low water or high water at Governors Island. The reference to the direction of the current, the flood current in the Harlem river, we have always considered that as running to the south, that is from the Hudson to East River.

2nd. The ebb current begins about an hour and a half after high water at Governors Island, but progresses from the south end of the river northward as indicated by the following figures:

At 116th St.		0 hr. 25 m. after H. W. G. I.	
" 122nd "	$\frac{1.10 + 1.30}{2}$	1 " 15 " " "	
" 131st "		1 " 20 " " "	
" 135th "		1 " 25 " " "	
" 139th "		1 " 20 " " "	
" 142nd "		1 " 30 " " "	
" 219th "		1 " 45 " " "	

These times are not from a sufficient number of observations to be able to predict the time of the changing tide of the Harlem River. The time of the tide changes with different conditions of wind, and different conditions of the flood in the Hudson River, so
1398 that they are simply what would be inferences from our experiments.

3rd. The mean flood velocity appears to vary from ¾ mile to 1¼ miles per hour.

Q. You are now speaking of the Harlem River?

A. Yes.

4th. The mean ebb velocity approximates 1.4 miles per hour or 2.0 feet per second.

5th. The maximum velocity varies with the cross-section of the channel, but in general it may be taken as about 2.35 miles per hour or 3.45 feet per second on the ebb. There is a reference to a note on the next page. Assuming the above figures as correct, there follows:

$$\frac{\text{Mean veloc.}}{\text{Max. veloc.}} \quad \frac{2}{3.45} \quad 0.58$$

According to the sin- curve..... $\frac{\text{Mean veloc.}}{\text{Max. veloc.}} \quad \frac{2}{\quad}$ 0.64

The theoretical variation in the velocity, according to the Coast Survey follows a sine curve. That is a curve is plotted in which a horizontal line corresponds to times and the vertical line corresponds to velocities, and that curve is such a one that the ordinants, the vertical lines, are proportioned to the sine of a circle, which is a trigonometrical function, on the assumption that the horizontal line between the highest point in the curve and the base is equivalent to three hours, nautical hours, three lunar hours.

These figures indicate that the general trend of sewage discharged into the Harlem River is toward the Hudson River. That the general progression in this direction is from one to two miles per tide. That the preponderance of discharge into the Hudson River over that into the East River may be taken provisionally at 40 per cent. That practically the entire contents of the Harlem
1399 River at the end of the flood passed into the Harlem River during the ebb, and that over half the contents at the end of the ebb passed into the East River during the flood.

The duration of slack water on either tide is shown to be short by the records of floats Nos. 6, 7, 8, 11, 12 and 13 as a rule not exceeding about fifteen minutes.

Although affected somewhat by the wind (see floats Nos. 5 and 7) and so in some instances driven toward the shore, there seems to be no general tendency in this direction. On the contrary, it is probable that floating matter generally follows the channel of the stream, and so finds a free exit to either the East or Hudson River. The normal tidal current, however, is subject to variations, not only

by the effect of the wind near the surface, but by the passage of vessels, the obstruction of piers and by the continual change in cross-section. In these reaches where the cross-section is constricted and the channel straight and uniform,—as in the Ship Canal,—a higher velocity will naturally obtain than where the opposite conditions are found.

The velocity of the float depends, not only on the above matters, but to a very considerable extent upon the part of the stream traversed. If near the short the velocity may be greatly retarded. The mean and maximum velocities indicated by the floats are therefore likely to be less than the actual velocities they represent.

On the flood a velocity of 2.35 was noted once. The other maximums falling below two miles per hour indicate the standard maximum to be less than it is on the ebb current. The path of float No. 3 represents the flow of an entire flood tide, that of float No. 5 nearly an entire flood tide, and that of No. 7 represents the flow of an entire ebb tide. Passing to float No. 13,—it might be well to say,
1400 that we consider the Harlem River extending to the south end of Ward's Island, which includes that part west of Ward's and Randall's Island.

Mr. McCarter: Don't you think that perhaps you are getting into some unnecessary prolixity here, as I understand Mr. Allen is simply reading from a report here. I do not suppose that report was all designed to be material to this controversy. Don't you think, for instance, speaking of a particular thing, cannot you put a few questions that will bring out the points you need?

Mr. O'Sullivan: Mr. McCarter, I have not had a moment to confer with Mr. Allen. It is now five minutes to one and during the recess I would be able to convey to him certain facts that I wish to elicit.

At 1 P. M. adjourned for noon recess until 2 P. M.

1401 Afternoon Session, 2 p. m.

CITY HALL, NEW YORK CITY,
January 3rd, 1912.

KENNETH ALLEN, a witness called on behalf of Complainants, recalled for further examination, testified as follows:

Direct examination by Mr. O'Sullivan (continued):

Q. Mr. Allen, you referred in your testimony to the float experiments by number. Will you state when you made the first of these float observations that you have described as No. 1?

A. August 14th, 1908.

Q. And did you have plotted the course of that float, the course it took in the river?

A. Yes.

Q. And have you got that plotted map with you?

A. I have.

Q. Now, will you describe what you did when you put the float in the water and the course it took and when you removed it from the water?

A. We put it in at Spuyten Duyvil Bridge across the Harlem.

Q. This is float No. 1?

A. No. 1 yes at 2.10 P. M. August 14th, and noted it going down on the ebb at different intervals. At 2:25 near Inwood, at 3.15 north of Fort Washington Point, at 3.40 at 158th Street, at 3.55 opposite 144th and at 4.05 opposite 138th Street, going down, all the time, just following the shore, near the shore all the way down.

Q. Did you make observations while you were in the field?

A. Observations were made at these different points at those times to locate the flow.

Q. And did you trace on any chart or map the course taken by that float?

A. Yes.

1402 Q. And have you the map here with you?

A. This is a print of the original map. The originals were made on tracing paper so the originals were printed, did not have to be traced.

Mr. O'Sullivan: I offer the chart with float No. 1 of August 14th, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 32.

Cross-examination by Mr. McCarter:

Q. Did you yourself personally watch the progress of the float No. 1 as to the course, just referred to?

A. I cannot say positively, but I am very sure that I did, because I began the work with the men to train them in the method of doing it.

Q. Assuming that you did, what method did you pursue in indicating on paper the course of the float?

A. The time and the observation, also the time of high water, or the direction of the currents were noted, and also the wind, in a note book, and the method of taking the observation was plain by the notes of the book. Now, I cannot say positively how these were taken, this one, No. 1, but I think those were determined the distance from the shore, opposite the streets.

Q. Well, you had no instrument with you, anything of that kind?

A. Oh, yes, we carried—we did not have a sextant I believe at this time, if I remember correctly we had at the beginning an azimuth compass, an instrument for locating the float.

Q. What you did was to watch generally the course of the float and notice position as well as you could opposite the given points?

A. Yes.

Q. And then the course between those points you hypothecated, I suppose?

A. That is right.

Q. Who actually prepared the tracings of which blue print Exhibit No. 32 is a print?

A. John B. Fox.

1403 Q. You yourself had nothing to do with that?

A. No, no more than general supervision of the drafting. I did not plot it myself.

Mr. McCarter: I think the paper is not properly proved. I object for that reason.

The Commissioner: Note the objection of counsel for defendants.

Received and marked Complainants' Exhibit No. 32.

Marked Complainants' Exhibit No. 32.

Mr. McCarter: May I ask another question to save time?

By Mr. McCarter:

Q. Is the same thing true of all the other exhibits that are before you, which are designated, I suppose to show the courses of the floats?

A. Yes, except in a good many, we used the sextant in making the observations.

Q. I do not understand that you yourself were present when all these observations were taken?

A. No.

Redirect examination by Mr. O'Sullivan:

Q. Can you tell us which ones you did personally attend?

A. No, I cannot,—I might be able to by referring to the books.

Q. Do you know where the books are?

A. They are at the office.

Q. Who was with you and did do the whole thing?

A. Not the same man every time. Mr. John E. Hill. He did most of the work at first, then later there were different men, there were quite a number that took part of them.

Q. Were these float observations made under your supervision?

A. Yes.

Q. And were these charts prepared under your supervision and on the data that you directed to have them prepared on?

A. Yes.

Q. And did you verify these charts after their preparation with the observers' data?

A. Not all of them myself. The man that made them

1404 verified them. I verified some, but I could not say just which. That is, I did not check over the plotting, go over the work, all over the work that the draughtsman had done.

Q. Now, as to Float No. 2, Mr. Allen?

A. Float No. 2 was put on the west side of Randall's Island at about half past ten in the morning. At 10:25 in the morning. On the west side of the stream opposite—about opposite 117th Street and went down stream for a short distance, a couple of blocks, one block opposite 116th Street by 10:36. It was moving down slowly, and so uncertainly that we took it up and put it in again at 10:54

opposite 118th Street, and it curved around to the southerly and easterly and then went up the north to about opposite 119th Street by 11:40. Then we took it up and reset it. It doesn't state here, but when that was done, it was because it had run aground or become fouled in some way, so that we could not continue the experiment without resetting it. We set it a short distance southwest, and at 11:44 it held upstream until about 12:21, then curved around and went southerly again until 2:52 when opposite 117th Street, showing that the currents in this part of the river at that time of the tide were not very definite. They were sometimes going one way, sometimes the other.

Q. Did you cause the course of that float to be plotted on a map?

A. I did.

Q. And have you that chart or map with you?

A. Yes.

Mr. Sullivan: I offer chart of the course of Float No. 2 August 15th 1908 in evidence.

Mr. McCarter: The same objection as I made before.

Mr. O'Sullivan: I asked that it be marked Complainants' Exhibit No. 33.

The Commissioner: Note the objection of counsel for defendants.

Received and marked Complainants' Exhibit No. 33.

1405 Marked Complainants' Exhibit No. 33.

Q. Now, as to float experiments made with Float No. 3 Mr. Allen?

A. Floats Nos. 3 and 4 were so insignificant that they were not plotted. I do not remember what happened whether the float was destroyed by a tug or whether it went ashore, but the record was of no value.

Q. Float observation No. 5?

A. August 17th. This was put in at 8:43 in the morning just east of the Spuyten Duyvil Bride in the Harlem River. It went upstream going ashore once or twice, until at 1:35 when it went ashore on the west side. It was reset at 1:40 and the current had changed. It went northerly until 4:40 in the afternoon, when it was taken up opposite the Kingsbridge Power house.

Q. Did you cause the course of that float No. 5 to be plotted on a chart or map?

A. I did, yes.

Mr. O'Sullivan: I offer that chart or map in evidence as showing the course just described taking by Float No. 5 on August 17th, 1908,—I offer that in evidence and ask that it be marked Complainants' Exhibit No. 34.

Mr. McCarter: The same objection.

The Commissioner: Note the objection of counsel for defendants.

The Commissioner: Received and marked Complainants' Exhibit No. 34.

Marked Complainants' Exhibit No. 34.

Q. As to your observations on Float No. 6?

A. Yes, August 18th. That was set out at 141st Street in the Harlem and went southerly until it got opposite Randall's Island. Then it went ashore five times each time on the eastern side and the last time it was—it went ashore four times and the last time it was taken up going easterly through little Hell Gate.

1406 Q. Did you cause the course which you have just described as taken by Float No. 6 to be plotted on a chart or map?

A. I did.

Mr. O'Sullivan: I offer the chart showing the course taken by float No. 6 on August 18th, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 35.

Mr. McCarter: The same objection.

The Commissioner: Note the objection of counsel for defendants. Received and marked Complainants' Exhibit No. 35.

Marked Complainants' Exhibit No. 35.

Q. What observations did you make on float No. 7, Mr. Allen?

A. Float No. 7 was put in near the bridge at Spuyten Duyvil at 9.39 A. M. August 19th, 1908. It went a short distance southerly of the second bridge from Spuyten Duyvil and went ashore at 11.58 on the west bank. It was reset in the middle of the stream under the third bridge from Spuyten Duyvil and went southerly to 136th Street and there the current changed at 3.35 P. M. At 4.32 it was taken out at the next bridge north of that. The second bridge north of that.

Q. Did you cause the course taken by float No. 7 to be plotted on a map or chart?

A. I did.

Mr. O'Sullivan: I offer the course taken by Float No. 7 on August 19th, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 36.

Mr. McCarter: The same objection.

The Commissioner: Note the objection of counsel for defendants. Received and marked Complainants' Exhibit No. 36.

Marked Complainants' Exhibit No. 36.

Q. Now, as to Float No. 8, what observations did you make on the course taken by that float?

A. It was put in on August 20th opposite 151st Street and it went northerly to the Washington Bridge and then the cur-

1407 rent reversed at 10.44 and it went southerly to opposite the south end of Randall's Island, and at 3.35 it reversed again and went north a short distance until 4.42 when it was taken out.

Q. Did you cause the course taken by Float No. 8 to be plotted on any map or chart?

A. I did.

Mr. O'Sullivan: I offer the chart showing the course of Float No. 8 taken August 20th, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 37.

Mr. McCarter: Same objection.
The Commissioner: Note the objection of Counsel for defendants.
Received and marked Complainants' Exhibit No. 37.
Marked Complainants' Exhibit No 37.

Q. What observations did you make of the course taken by Float No 9?
A. No. 9 was put in opposite 112th Street at 8 minutes past nine in the morning.
Q. What day?
A. August 21st and first went northeasterly for a short distance, and then southwesterly, still opposite about the same street, and then southerly to 104th Street when the current reversed and at 10:53 A. M. it went northerly until 2 o'clock when it was about opposite 118th Street and then southerly until about 3 o'clock, then westerly and northerly, and it was taken out at 4 o'clock opposite 116th Street.

Mr. O'Sullivan: I offer the chart showing the course taken by Float No. 9 on August 21st, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 38.
Mr. McCarter: Same objection.
The Commissioner: Note the objection.
Received and marked Complainants' Exhibit No. 38.
Marked Complainants' Exhibit No. 38.

Q. What was the next float observation that you made in the Harlem River?
1408 A. No. 11, August 25th. That was put in at 145th Street at 7.21 A. M. and at 8.49 A. M. went southerly until 8.49 A. M. then northerly passing out of the Harlem River under the Spuyten Duyvil Bridge at 12.34 P. M. It then went south passing Fort Washington at 1.52 P. M. and was taken up at 3.48 P. M. about 138th Street.
Q. Did you cause the course taken by that float No. 11 to be plotted on a map or chart?
A. Yes.

Mr. O'Sullivan: I offer chart showing the course taken by float No. 11 August 25th, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 39.

Mr. McCarter: Same objection.
The Commissioner: Note the objection.
Received and marked Complainants' Exhibit No. 39.
Marked Complainants' Exhibit No. 39.

Q. Now, as to Float No. 12. What observations did you make?
A. That was put in at 8.45 A. M. at the Third Avenue Bridge. It went a short distance down stream and at 9 o'clock the current turned and went northerly and reached the Spuyten Duyvil Bridge at 1.05 and was taken up at 11 minutes past one, starting down stream, down the Hudson.
Q. Did you give me the day of the month?

A. August 26th.
Q. 1908?
A. Yes.

Mr. O'Sullivan: I offer in evidence chart showing the course taken by Float No. 12 on August 26th, 1908, and ask that it be marked Complainants' Exhibit No. 40.
Mr. McCarter: Same objection.
The Commissioner: Note the objection.
Received and marked Complainants' Exhibit No. 40.
Marked Complainants' Exhibit No. 40.

Q. What observations did you make on Float No. 13?
A. There are two number 12's. This is a detail of the same experiment showing the sketch of how it wound around at a
1409 certain point when the tide changed.

(By agreement of counsel the diagram above referred to, being the second No. 12, is attached as part of Complainants' Exhibit No. 40.)

Q. What observations did you make on the course taken by Float No. 13?
A. That was on August 27th. That was put in at 8.34 in the morning nearly opposite the north end of Randall's Island. It went southerly a short distance and at 9.36 went northerly passing the Spuyten Duyvil draw at 2.52 P. M. and it was taken up at 3.42 P. M. a short distance south of that in the Hudson River.
Q. Did you cause the course taken by Float No. 13 to be plotted on a map or chart ?
A. I did.

Mr. O'Sullivan: I offer that map or chart showing the course taken by Float No. 13 on August 27th, 1908 together with a detail sketch, also marked Float No. 13, August 27th, 1908, I offer them both in evidence and ask that they be marked Complainants' Exhibit No. 41.
Mr. McCarter: Same objection.
The Commissioner: Note the objection.
Received and marked Complainants' Exhibit No. 41.
Marked Complainants' Exhibit No. 41.

Q. When did you next make any float observations in the Harlem River?
A. August 28th, No. 14.
Q. What number was the float experiment?
A. No. 14 .
Q. Describe the course taken by No. 14?
A. That was put in west of the north end of Blackwell's Island, it went northerly and easterly through Hell Gate to opposite North Brother Island. There at half past ten the current changed and it skirted the shore of the Bronx, went through the Bronx Kills and down the Harlem until 6 minutes past four when it was taken out at the third bridge from Spuyten Duyvil.

Q. Did you describe the course taken by Float No. 14
1410 on any map or chart?
A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by Float No. 14 on August 28th, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 42.
Mr. McCarter: The same objection.
The Commissioner: Note the objection.
Received and marked Complainants' Exhibit No. 42.
Marked Complainants' Exhibit No. 42.

Q. When did you next make any float observations in the Harlem River?
A. November 24th. That float record is nearly all in the Hudson River and I think it is properly classed as Hudson River records.
September 9th, 1908, this was put in at three minutes past 8. It went up easterly until 8.30 then westerly passing through into the Hudson River at 8.44.
Q. When did you say it was?
A. It was put in just east of the Spuyten Duyvil Bridge at 8.03, and went easterly a short distance until 8.30 then westerly, passing under the Spuyten Duyvil Bridge, at 8.44, then northerly into the Hudson until 9.27 and remained about that position until 10.19. Then it went southerly being taken out at 4.03, about 45th Street.
Q. Did you cause the course taken by Float No. 24 to be plotted on a map or chart?
A. I did.

Mr. O'Sullivan: I offer the chart showing the course taken by Float No. 24 on September 9th, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 43.
Mr. McCarter: Same objection.
The Commissioner: Note the objection.
Received and marked Complainants' Exhibit No. 43.
Marked Complainants' Exhibit No. 13.

1411 Q. Did that complete your float observations for the Harlem River?
A. It did, yes.
Q. Did you compile various details and submit them in the form of a report to the commission of the observations made by you on these various float experiments and observations that you have testified to?
A. I did.
Q. Is that a copy of the report submitted by you on these observations, with all the details and conclusions that you drew therefrom?

(Witness compares copy with originals.)

A. It is.

Mr. O'Sullivan: I offer this report made by this witness to the President of the Metropolitan Sewerage Commission on float obser-

vations, with all their detail and conclusions in evidence, and ask that it be marked Complainants' Exhibit No. 44.

Mr. McCarter: I object to that as irrelevant. Res inter alios acta, and incompetent. I will have to brush up my Latin.

Mr. O'Sullivan: And our contention is Qui facit per alium facit per se.

The Commissioner: Note the objection of Counsel for defendants. Received and marked Complainants' Exhibit No. 44.

Marked Complainants' Exhibit No. 44.

Q. What was the next series of float observations taken by you, Mr. Allen, in compliance with your duties as engineer to the Metropolitan Sewerage Commission?

A. These are not taken in consecutive series, but the next one in order, perhaps would be the lower East River. This is part of the East River south to Hell Gate, beginning with Float No. 10. That was put in just west of the south end of Randall's Island at 9.10
August 24th, 1908. It went southerly to the west side of
1412 Governor's Island at 1.40 P. M. and then northeasterly to
the east shore of Brooklyn, opposite South Ferry, where it was taken up at 3.20 P. M.

Q. Did you cause the course of that Float No. 10 to be plotted on a map?

A. I did.

Mr. O'Sullivan: I offer that chart or map showing the course taken as just described by this witness by Float No. 10 on August 24th, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 45.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 45

Marked Complainants' Exhibit No. 45.

The Witness: Float No. 16 August 31st, 1908, was put in at 9.15 A. M. southwest of Riker's Island and went easterly until 11 o'clock, then southwesterly until 11.15, when it was taken out and reset at 12.23, just southeast of Riker's Island and was then taken by the ebb current to the west and down through Hell Gate, west of Blackwell's Island, and taken up at the Williamsburg Bridge at 4.27 P. M.

Q. Did you cause the course by Float No. 16 on August 31st, 1908, to be plotted upon any map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the courses taken by Float No. 16 August 31st, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 46.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 46.

Marked Complainants' Exhibit No. 46.

Q. The next one?

A. No. 23, September 8th, 1908, was put in opposite the north side, the north end of Blackwell's Island opposite 86th Street
1413 at 8.41 A. M. It went southerly through the westerly channel, passed out of the East River and west of Governor's Island, until opposite Bay Ridge where it turned northerly at 1.45 P. M. and at 4 o'clock was taken out between Robbins Reef and Gowanus Canal.

Q. Did you cause the course taken by Float No. 23 to be plotted on any map or chart.

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by Float No. 23 on September 8th, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 47.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 47.

Marked Complainants' Exhibit No. 47.

The Witness: Float No. 27, September 12th, 1908. This was put in at 8.25 A. M. east of the southern end of Governor's Island. It went northerly until above the Williamsburg Bridge, and turned at 10:40 A. M. and went down stream again and was taken out at 1.12 P. M. opposite Gowanus Bay.

Q. Did you cause the course taken by that float No. 27 to be plotted on any map or chart?

A. I did.

Mr. O'Sullivan: I offer the chart or map showing the course taken by Float No. 27 on September 12th, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 48.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 48.

Marked Complainants' Exhibit No. 48.

Q. The next one?

A. Float No. 38 started at 3.02 A. M. west of the north end of Blackwell's Island. It went northerly to opposite Halsey Street, Queens, and at 3.55 A. M. reversed and went down the westerly side of Blackwell's Island to opposite Gowanus Bay at 8.44 A. M.
1414 Then easterly toward Gowanus Canal until 9.47 A. M. then northerly along the easterly shore—the west shore of Brooklyn and east of Blackwell's Island, until 3.34 P. M. opposite Pierce Avenue, Borough of Queens. Thence southerly to the Queens Borough Bridge and was taken up at 4.18 P. M.

Q. That float observation covered all the tides of what period?

A. It covered two full tides.

Q. Did you cause the course taken by Float No. 38 to be plotted on any map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken

by Float No. 38 on October 3rd, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 49.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 49.

Marked Complainants' Exhibit No. 49.

The Witness: Float No. 39, October 5th, 1908. It was put in opposite the 64th Street pier, South Brooklyn, at 11.35 A. M. It went northerly past—east of Governor's Island, and a little north of Newtown Creek, until 5.24½ P. M. when it went easterly until 5.55 P. M. and then southerly until 6.02 P. M. and was taken out.

Q. Did you cause the course taken by Float No. 39 to be plotted on a map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by Float No. 39 on October 5th, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 50.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 50.

Marked Complainants' Exhibit No. 50.

Q. Did that complete that series of float observations of the East river south of Hell Gate?

A. Yes.

1415 Q. Did you make a report giving the details and conclusions from that series of experiments, and submit it to your Metropolitan Sewerage Commission?

A. I did.

Q. About when?

A. November 19th, 1908.

Mr. O'Sullivan: I offer the report made by this witness to the President of the Metropolitan Sewerage Commission on November 19th, 1908, on the series of float observations made in the East River south of Hell Gate, with full details and conclusions drawn therefrom. I offer that in evidence and ask that it be marked Complainants' Exhibit No. 51.

Mr. McCarter: I object to it on the ground that it is irrelevant, immaterial and incompetent.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 51.

Marked Complainants' Exhibit No. 51.

Q. What was the next series of experiments with floats or float observations?

A. In the East River, east of Hell Gate.

Q. Just state them, Mr. Allen?

A. The first is that No. 14, that I said we took for the Harlem River. It is classed here with the East River. It was really put in the East River, but it went up the Harlem.

Mr. O'Sullivan: Just state that that is shown in Complainants'

Exhibit No. 42 showing the course of Float No. 14 on August 28th, 1908. Was that part of this series that you are now describing?

The Witness: I might say in explanation that some of these may belong to two series, being partly in one river and partly in another.

Q. The next one?

A. No. 15 was on August 29th, 1908. It was set out at 8.42 A. M. just southwest of Randall's Island and went easterly through
1416 Little Hell Gate east of Sunken Meadow and west of North Brother Island and was taken up at 11.05 A. M. northwest of Riker's Island.

Q. Did you cause the course of that Float No. 15 to be traced on any map or chart?

A. I did.

Mr. O'Sullivan: I offer the chart or map showing the course taken by Float No. 15 as described by this witness on August 29th, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 52.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 52.

Marked Complainants' Exhibit No. 52.

The Witness: Float No. 16 has ben described under the flow of the East River. Float No. 16 has already been described as Complainants' Exhibit No. 46, and is included in the series that I am now describing.

Float No. 17 was set in at 9.15 A. M. September 1st, 1908, between North Brother Island and the South Brother Island and went easterly to the south shore of old Ferry Point, where it was taken out at 12.35 P. M. and it was reset at 2.37 P. M. north of Whitstone Point, and then went westerly until 3.30 P. M. when it was off Tollman Island and was taken up.

Q. Did you cause the course taken by Float No. 17 on September 1st, 1908, to be plotted upon any map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by Float No. 17 on September 1st, 1908 in evidence, and ask that it be marked Complainants' Exhibit No. 53.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 53.

Marked Complainants' Exhibit No. 53.

The Witness: Float No. 18, September 2nd, 1908, was set
1417 out at 8.45 A. M. south of Baretto Point, and went easterly, skirting along old Ferry Point, and going aground at 1.40 just north of Throggs Neck. It was reset at 1.48 and went northwesterly until 3.50 P. M. when it was taken up.

Q. Did you cause the course taken by Float No. 18 to be plotted upon a map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by Float No. 18 on September 2nd, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 54.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 54.

Marked Complainants' Exhibit No. 54.

The Witness: Float No. 19 was set out September 3rd, 1908, just north of Whitestone Point. It went easterly and north easterly, past Fort Schuyler until 11.31 A. M. when the current reversed and it was taken out at 2 P. M. still being easterly of Fort Schuyler.

Q. Did you cause the course taken by that float to be plotted on a map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by Float 19 September 3rd, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 55.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 55.

Marked Complainants' Exhibit No. 55.

The Witness: Float No. 25, September 10, 1908, was set out off the shore of Queens, east of Little Neck Bay, and it went westerly north of North Brother Island and east of Ward's Island, where it was taken up at 3.45 P. M.

Q. Did you cause the course taken by that float No. 25
1418 on September 10th, 1908, to be plotted on a map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing its course in evidence and ask that it be marked Complainants' Exhibit No. 56.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 56.

Marked Complainants' Exhibit No. 56.

Q. Now, Mr. Allen, did you embody in a report to the Metropolitan Sewerage Commission the facts observed with their complete detail and such observations as you had to make and conclusions drawn from that series of experiments?

A. I did.

Q. When did you make that report?

A. November 9th, 1908.

Mr. O'Sullivan: I offer in evidence report made by this witness on November 9th, 1908, on the float observations in the East River, east of Hell Gate with the data and matters described by this witness. I offer it in evidence and ask that it be marked Complainants' Exhibit No. 57.

Mr. McCarter: I object to it as irrelevant, incompetent, immaterial and res inter alios acta.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 57.

Marked Complainants' Exhibit No. 57.

Q. Did the series that you have just testified to, Mr. Allen, complete your float observations in the upper East River?

A. Yes.

Q. Now, what next series of float observations did you undertake?

1419 A. In the New York Upper Bay near Robbins Reef. Float No. 28 was set out a short distance southeast of Robbin's Reef September 16th, 1908, at 8.35 P. M. and went westerly through the Kill von Kull, south of Shooter's Island. There the tide turned at 1.24 and 2.03 it was taken up near the same point.

Q. Did you cause the course of Float No. 28 to be plotted or charted?

A. I did.

Mr. O'Sullivan: I offer the chart or map showing the course as described by this witness of Float No. 28 on September 16th, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 58.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 58.

Marked Complainants' Exhibit No. 58.

The Witness: Float No. 29 was set out September 17th, 1908, easterly from Robbins' Reef at 8.15 A. M. It went southerly toward the Stapleton shore and was reset at 9.45 and at 10.07 the tide turned, and then the float went off from the shore until 10.55 then northerly, or a little east of northerly toward Governor's Island and was taken out of the Atlantic Basin at 4 o'clock,—no, it went northerly to between Gowanus Bay and Governor's Island until 3.45 and then southwesterly until 4 o'clock when it was taken out.

Q. Did you cause the course taken by Float No. 29 to be plotted on a map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by float No. 29 on September 17th, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 59.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

1420 Received and marked Complainants' Exhibit No. 59.

Marked Complainants' Exhibit No. 59.

The Witness: Float No. 30, September 18th, 1908, was set out a short distance southeast of Robbin's Reef at 8.14 A. M. It went southerly to the shore of Staten Island and was reset at 9.47 and at 10.42 it went toward the shore until at 11:03 and then easterly and northerly until 1.41 P. M. when it was taken out between Staten Island and Bay Ridge.

Q. Did you cause the course taken by Float No. 30 to be plotted or chartered?

A. I did.

Mr. O'Sullivan: I offer the chart or map showing the course

taken by Float No. 30 on September 18th, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 60.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 60.

Marked Complainants' Exhibit No. 60.

The Witness: Float No. 31 was put in September 22nd, 1908, a short distance southeast of Robbins Reef and went southerly through the Narrows, skirting the westerly shore, until at 1.14 P. M. when the current reversed, and it went northeasterly along the shore until 2.51 P. M. and was taken out.

Q. Did you cause the course taken by Float No. 31 to be plotted or chartered.

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by Float No. 31 on September 22nd, 1908, in evidence—and ask that it be marked Complainants' Exhibit No. 61.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 61.

Marked Complainants' Exhibit No. 61.

The Witness: Float No. 32, set out September 25, 1908, a
1421 short distance southeast of Robbins' Reef and went——

Q. Give the date?

A. September 25 at 8.50 A. M. and went northeasterly until opposite Gowanus Bay, until 10.01 A. M. and then southeasterly and southerly through the Narrows close to Fort Wadsworth, until 3.13 P. M. when it was a short distance southeast of Hoffman Island. At that time the current reversed and it went toward Hoffman Island and was taken out at 3.25 P. M.

Q. Did you cause the course taken by Float No. 32 to be plotted or charted on a map?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by Float No. 32 in September 25, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 62.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 62.

Marked Complainants' Exhibit No. 62.

The Witness: Float No. 33, September 26th, 1908, set out a short distance southeast of Robbins Reef.

Q. The date?

A. At 7.10 A. M. on September 26th. It went southeast to a point between Ellis Island and Governor's Island, and at 10.54 A. M. the current reversed and at 12 o'clock it was taken out close to Liberty Island.

Q. Did you cause the course taken by Float No. 33 to be plotted or charted upon a map?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken as Float No. 53 as described by this witness on September 26th, 1908, in evidence, and ask that it be marked Complainants' Exhibit No. 63.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 63.

Marked Complainants' Exhibit No. 63.

1422 The Witness: Float No. 34, was started September 28th, 1908, a short distance southeast of Robbins Reef at 7.08 A. M. It went northerly passing close to Communipaw, and at 1.26 the current reversed opposite 60th Street Manhattan, the float being close to the westerly shore of the river and at 2.07 it was taken out close to one of the piers opposite 54th Street.

Q. Did you cause the course of float No. 34 to be plotted on a map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart of the course taken by float No. 34 on September 28th, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 64.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 64.

Marked Complainants' Exhibit No. 64.

The Witness: Float No. 35, September 29th, 1908 was set out a short distance from Robbins Reef at 8.07 A. M. and went northeasterly until 11:30 A. M. when it was a short distance from the shore at Red Hook. It then went south skirting along the shore until 3.08 P. M. when it was taken out at Bay Ridge.

Q. Did you cause the course taken by Float No. 35 to be plotted or charted on a map?

A. I did.

Mr. O'Sullivan: I offer the chart or map showing the course taken by Float No. 35 on September 29th, 1908, in evidence as described by this witness, and ask that it be marked Complainants' Exhibit No. 65.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 65.

Marked Complainants' Exhibit No. 65.

1423 The Witness: Float No. 37 was set out on October 1st, 1908, a short distance southeast of Robbins' Reef at 8.14 A. M. It went southwesterly a short distance, and at 9.11 A. M. turned northerly, went past Robbins Reef Light and then northeasterly to Pier A, North River, where it was reset at 12.56 P. M. and then it went northerly along the—and near the piers until at 3.20 P. M. when the current reversed and at 3.43 it has taken out a short distance down stream.

Q. Did you cause the course taken by Float No. 37 to be plotted on a map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by Float No. 37, on October 1st, 1908, as testified to by this witness, in evidence, and ask that it be marked Complainants' Exhibit No. 66.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 66.

Marked Complainants' Exhibit No. 66.

Q. Mr. Allen, did that complete the series of observations from and near Robbins Reef?

A. It did.

Q. Did you submit a report giving full details of the observations made at that time to the Metropolitan Sewerage Commission?

A. I did, February 18th, 1909.

Q. Have you compared the copy of the report which I just handed to you, dated February 18th, 1909, with your original minutes?

A. I have.

Q. And found it?

A. To be the same, a copy of the same.

Q. To be a correct copy?

A. So far as I could see.

Mr. O'Sullivan: I offer in evidence the report made by this witness to the president of the Metropolitan Sewerage Commission, relative to the series of float observations, to which he has just now testified, the report being dated February 18th, 1909. I offer it in
1324 evidence and ask that it be marked Complainants' Exhibit No. 67.

Mr. McCarter: I object to it as incompetent, irrelevent, and immaterial, res inter alios acta.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 67.

Marked Complainants' Exhibit No. 67.

Q. Did the observations that you have just testified to, which you reported, complete the series of observations of float experiments in the Upper Bay?

A. They did, not in the Upper Bay, but from near Robbins Reef.

Q. What was the next series of float observations made by you?

A. There were other float observations in the Upper and Lower Bay and the Kill von Kull.

Float No. 36. This is supplementary to the East River. That was set out on December 30th, 1908, at 7.42 A. M. east of the Battery on the east side of the River and went northerly and was taken up and reset at 9 o'clock 9.23 and 9.31 running so close to the easterly shore. Then it passed the mouth of Newtown Creek and went up the west side of Blackwell's Island and to the east side of North Brother Island. Then the current reversed at 12.34 P. M. and it returned east of Ward's Island and skirting along the Manhattan shore was taken up at 3.18 P. M. in the vicinity, a little south of the Queensboro Bridge.

Q. How long a period as to tides did that float observation cover?

A. It covered about one tide and a half. That is a flood tide and about half the ebb tide.

Q. And covered about how much of a distance during your observations?

A. 14 miles and a quarter.

Q. And how many hours of the flood and now may hours of the ebb tide was it under observation?

A. Of the flood tide, it was under observation five hours and of the ebb tide 2 hours and a half.

Q. That was one of the longest of the float records, was
1425 it not?

A. One of the longer ones. I remember some were longer than that.

Q. Did you make a special report on the facts observed during the passage of Float No. 36?

A. I did.

Q. And as a supplement to what report?

A. To the report of November 19th, on the float observations in the East River south of Hell Gate, of which this is a copy.

Q. Have you compared the copy of your report furnished on February 13th, 1909, to the President of the Metropolitan Sewerage Commission with your original notes and memoranda?

A. I have, and it is the same.

Q. Did you cause the course of that Float No. 36 to be plotted on any map or chart?

A. Yes, I did.

Mr. O'Sullivan: I offer the chart or map showing the course of Float No. 36 on September 30th, 1908 in evidence and ask that it be marked Complainant's Exhibit No. 68.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 68.

Marked Complainants' Exhibit No. 68.

Mr. O'Sullivan: And I offer the special report made on this report of float observations of Float No. 36 as noted and compared by this witness with one original memoranda—I offer it in evidence and ask that it be marked Complainants' Exhibit No. 69.

Mr. McCarter: Objected to as incompetent, irrelevant and immaterial.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 69.

Marked Complainants' Exhibit No. 69.

Q. What was the next series of float observations made by you?

A. I made a report on observations of floats in the Upper
1426 and Lower Bays. I made a tabular statement of float records in the Upper and Lower New York Bays, but unaccompanied by a report.

Q. Give us the details of that?

A. No. 21 was set out September 4th, 1908 in the Narrows, near the middle, and it went towards Coney Island Point. It was set out at 8.31 A. M. and 10.30 A. M. it reversed direction off Coney Island Light, and then swung around towards the southeasterly and was taken up at 1.22 in the middle of Gravesend Bay.

Q. Did you cause the course of that float No. 21 to be plotted on any map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course of float No. 21 as described by this witness on September 4th, 1908 in evidence and ask that it be marked Complainants' Exhibit No. 70.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 70.

Marked Complainants' Exhibit No. 70.

The Witness: Float No. 26 was set out in the middle of the Narrows on September 11th, 1908, at 8.08 A. M. It went northerly until about west of Pennsylvania Terminal at South Brooklyn, north of Bay Ridge and at 10 o'clock reversed direction and at 10.26 was taken up a short distance from there.

Q. Did you cause the course of Float No. 26 to be plotted on a map or chart?

A. I did.

Mr. O'Sullivan: I offer the map or chart showing the course taken by float No. 26 on September 11th, 1908, as testified to by this witness in evidence and ask that it be marked Complainants' Exhibit No. 71.

Mr. McCarter: The same objection.

The Commissioner: Note the objection.

Received and marked Complainants' Exhibit No. 71.

1427 Marked Complainants' Exhibit No. 71.

The Witness: Float No. 22, September 5th, 1908, was set out at 10.10 A. M. east of the Vernon Avenue Bridge, Newtown Creek. I am not sure whether it is east or west—between the old Vernon Avenue Bridge and Oakland Street, and at 12.48—it was reset at 10.35 near Oakland Street, and at 11.08 opposite Shawnet Street at 11.28 and at 11.47 and again at 12.50 opposite Dutch Kills. At 1.15 P. M. the current reversed opposite Whale Creek and it grounded opposite Pier 13 at 1.29. It was reset at 1.30 opposite Pier 14, and taken out again at 2.03 near Pier 13.

Q. Did you cause the Float No. 22 to be plotted on any map or chart?

A. I did.

Mr. O'Sullivan: I offer the course as described by this witness and which he had plotted under his direction relating to Float No. 22 on September 5th, 1908, in evidence and ask that it be marked Complainants' Exhibit No. 72.

Mr. McCarter: The same objection.

The Commissioner: Note the objection. Received and marked Complainants' Exhibit No. 72.

Marked Complainants' Exhibit No. 72.

The Witness: That completed the series of float experiments made in 1908. There was another series made in November and December, 1909, of which these are the records.

At 4 P. M. adjourned to meet again on January 4th, 1912 at 10:30 A. M.

Adjourned to January 4, 1912, at 10:30 A. M.

[End of Volume I.]